Engineering Library

ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXVIII. No. 3290 DECEMBER 13, 1940 JAN 15 1941 SIXPENCE

FERRANTI

METERS

FERRANTI LTD., HOLLINWOOD LANCS. London Office Bush House, Aldwych, W.C.2.

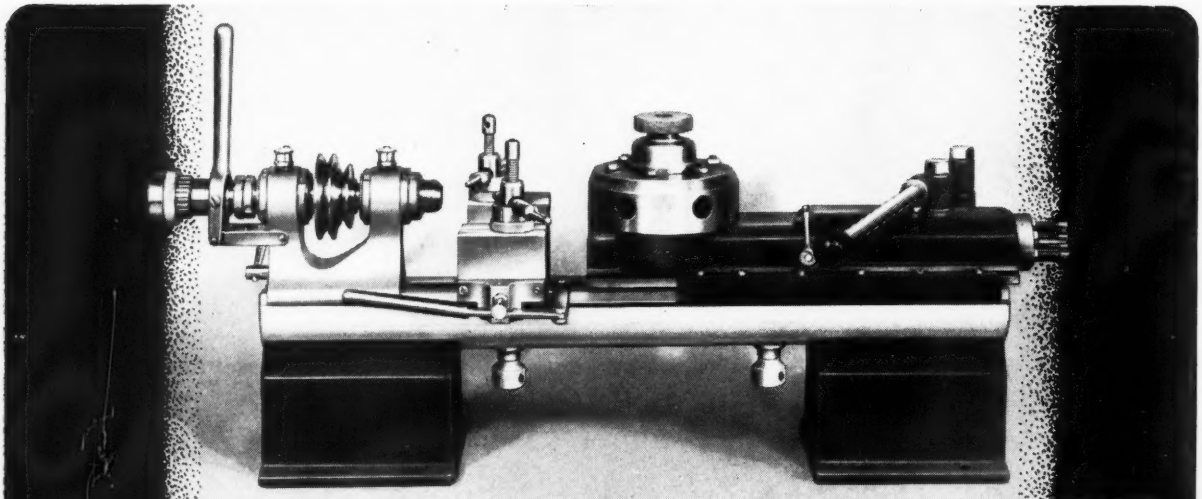
FM71

Some of our Wire Drawing Plant
COPPER WIRE & STRIP
H.C. Soft plain tinned and Hard Drawn for all purposes
R. H. SYMONDS LTD.
39 VICTORIA STREET, WESTMINSTER, S.W.1
ABBEY 2771

MICA

WASHERS
DISCS
CONDENSER PLATES
ELEMENT STRIPS
DIAPHRAGMS
STOVE PLATES
RAW MICA

BRITISH MICA CO. LTD. - BEDFORD



PULTRA CAPSTAN LATHE MODEL L335/7

DESCRIPTION
BED 16" LONG.
LEVER HEADSTOCK
CENTRE HEIGHT 50 m/m,
BORE OF SPINDLE 8 m/m,
COLLET BORE THROUGH (MAX) 5m/m, partly through (Max) 6.5 m.m.
MAX. SPEED 6,000 r.p.m.
CAPSTAN REST with 6 tool holes of ¼" Ø, maximum useful travel 1½".
DOUBLE TOOL CROSS SLIDE lever or screw operated.

PULTRA MANCHESTER SMALL PRECISION LATHES
British Made to highest International Standards

PULTRA LIMITED, ENGINEERING SPECIALISTS,
24, GRAVEL LANE, SALFORD, MANCHESTER

PRECISION STAMPING - GAUGING - MACHINING

MICA and MICANITE

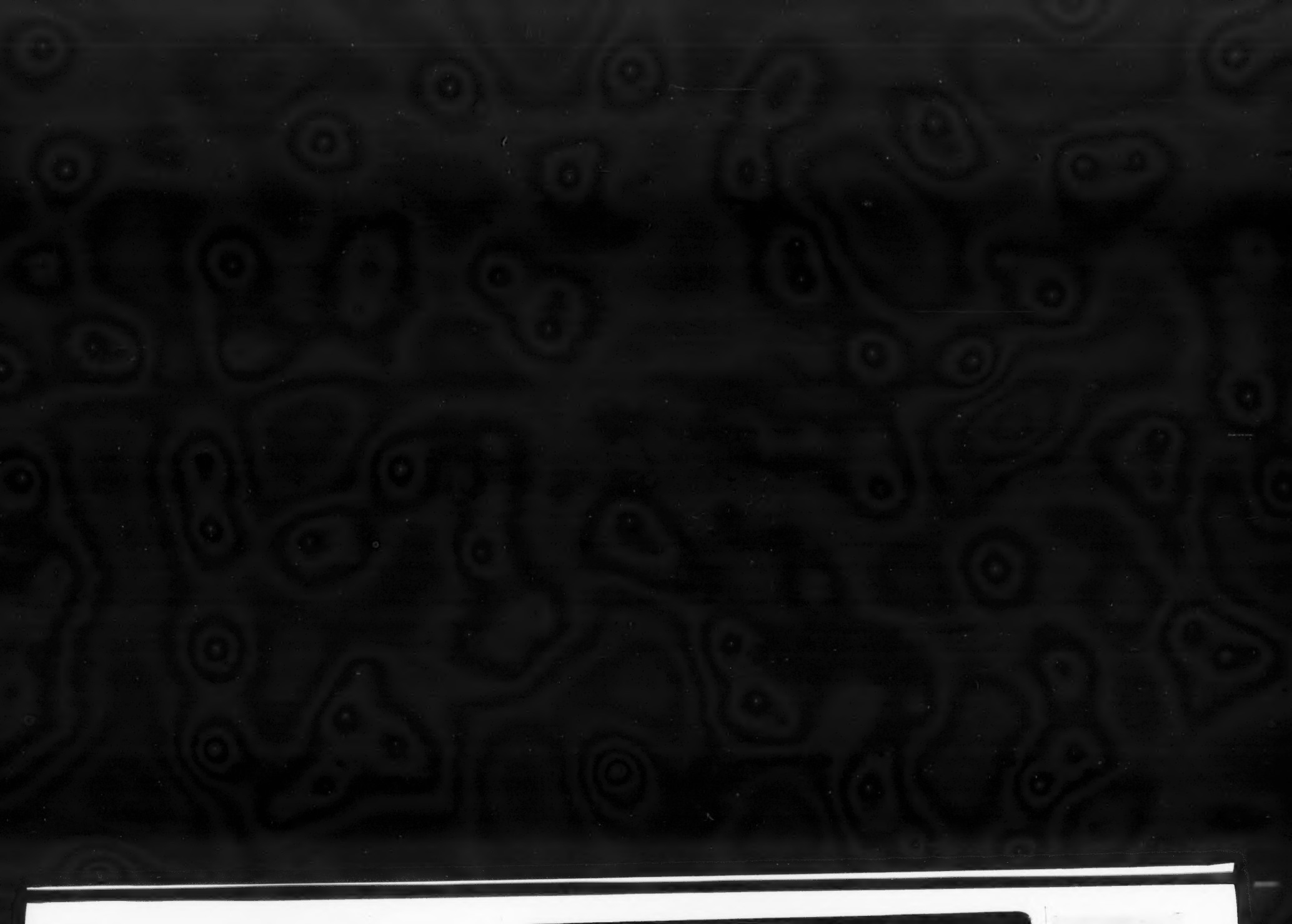
INSULATORS for ELECTRICAL WORK

Grams "MICAYLOR LONDON"

TAYLOR & PETTERS, LTD.
INSULATION ENGINEERS
3/11, WESTLAND PLACE, CITY ROAD, LONDON N.1.

Phone CLERKENWELL 4105

MICA BRIDGES for RADIO VALVES



THE ELECTRICAL REVIEW

Volume CXXVIII — No. 3290

Friday, December 13th, 1940

Contents

	Page
Editorial—Women and Electrical Work	123
Repairing Air-raid Damage	125
Personal	127
Beet Sugar Production	129
Correspondence	130
Boiler Water Properties	130
Rules for Electrical Mining. By J. A. B. Horsley, O.B.E., M.I.E.E.	131
Raid Precautions in Works. By H. Greaves	133
The Contractors' Association	134
Liverpool University H.-V. Laboratory	134
New Electrical Products	135
Commercial and Industrial	136
Electricity Supply	138
Overseas Electrical News	140
New Patents	141
Financial Section	142
Contract Information	146

Classified Advertisements (Official Notices, Situations Vacant, etc.)	45
Index to Advertisers	68

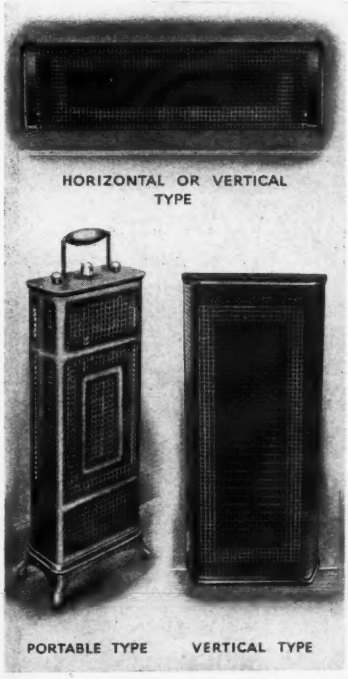
EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1

Telegraphic Address: "Ageekay, Sedist, London." Code: A B C. Telephone No.: Waterloo 3333 (35 lines)

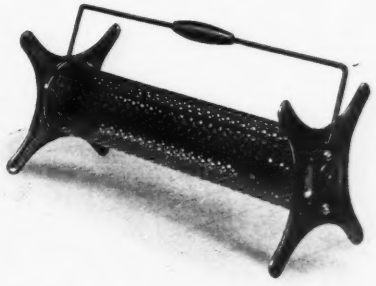
Subscription Rates, Postage free: United Kingdom, £1 16s. 10d.; Canada, £1 12s. 6d.; Colonial and Foreign, £2 1s. 6d. per annum

Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW LTD., and crossed "Lloyds Bank"

BRAY



ELECTRIC HEATERS for AIR-RAID SHELTERS



TOTALLY ENCLOSED — FULLY PROTECTED

GUARD AGAINST FIRE AND SHOCK! FIT CORRECTLY DESIGNED HEATERS

Full particulars on application

GEO. BRAY & CO. LTD., LEEDS 2

London Office: 501/2 Grand Buildings, Trafalgar Sq., W.C.2

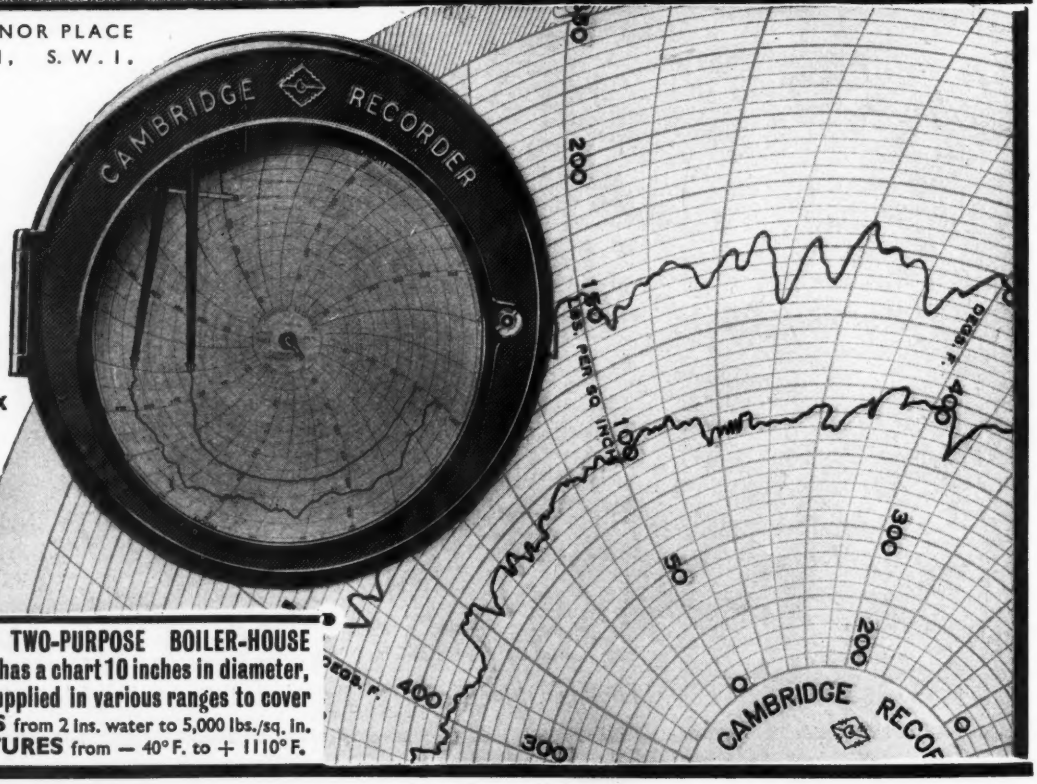
Berry's

7 — WAY

SEE PAGE 33

CAMBRIDGE INSTRUMENT CO. LTD.

13 GROSVENOR PLACE
LONDON, S.W.1.



For details
ASK FOR
LEAFLET 58-X

This useful TWO-PURPOSE BOILER-HOUSE INSTRUMENT has a chart 10 inches in diameter, and can be supplied in various ranges to cover PRESSURES from 2 ins. water to 5,000 lbs./sq. in. TEMPERATURES from — 40° F. to + 1110° F.

THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER —— ESTABLISHED 1872

Vol. CXXVIII. No. 3290 DECEMBER 13, 1940 Price SIXPENCE

Women and Electrical Work

The Supply Industry's Decision

EXCEPT for the office and the showroom, the electricity supply industry has been regarded hitherto as an exclusively male preserve. Thousands of women are engaged in electrical manufacturing and there are even women electrical contractors—not many, but sufficient to indicate the possibilities. Therefore the agreement of the National Joint Industrial Council to admit women to the operative branch of the electricity supply industry for the period of the war is a considerable concession to wartime needs.

What is perhaps a greater concession is the acceptance of the principle of equal pay for equal work—a subject which has proved a very thorny one in the past. There are many kinds of work to which women are particularly adaptable but a very cogent reason for their employment in peacetime has been their willingness to accept lower rates of pay and that is why the male trade unions have generally not been too friendly towards their employment. This hostility has been disguised by advocacy of the equality principle, the unions knowing well that on level terms women were seldom likely to be preferred to men. The women's unions, too, have stood out for equal treatment ; they were bound to do so despite the possible effect upon employment among their members.

Fitting Them In

We are not concerned, however, with the rights and wrongs of this subject, into which so many considerations enter, but with the possible results of the N.J.I.C.'s decision. So far we have been unable to discover which particular grades are likely to be affected. Meter reading occurs to us as a possibly suitable job for women and there may be other examples of semi-skilled or unskilled work which they could undertake, provided the physical strain were not too great. During the last war women were employed to a small extent as switchboard attendants and for cleaners' work. So far as switchboard work is concerned, the greater possibility of emergencies arising to-day has put a somewhat different complexion on affairs, although we realise that there are women capable of coping with them.

It is when we come to consider the skilled grades that questions arise. It is thought essential for male electricians, jointers and so forth to serve a long apprenticeship. The agreement provides merely for a probationary period of six months in which entrants are required to show their fitness for the work. But this cannot be regarded as a training period ; women must come to the industry with some knowledge of the work upon which they are to be engaged.

Government's Training Scheme

The Government has a scheme for training women for employment in the engineering industry, but this appears to apply only to mechanical engineering. There is no scheme for the electrical training of women if we except the course for demonstrators organised by the Electrical Association for Women. This, however, does not do more than give those who take it a general knowledge of the purpose and operation of electrical apparatus (mainly domestic). It may be considered a good grounding, but it does not pretend to produce practical electricians.

It seems, then, that unless intensive specialised courses can be arranged there is little prospect of any but exceptional women finding skilled employment in the electricity supply industry, and it must be acknowledged that there is a " mystery " in electrical work that makes it very different from mechanical engineering.

So far the proposal to employ women has been confined to the operative grades, but no doubt the decision of the N.J.I.C. will have its influence upon the National Joint Board of Employers and Members of Staff. Here the problem will be even more interesting for the training necessary to equip a staff man for his duties certainly cannot be acquired over-night as it were. Maybe on the " commercial engineering " side there is work for women, but that aspect has faded

somewhat and it is the technical and operational work which assumes the greater importance nowadays. We have mentioned the fact that there are a few women in the electrical contracting industry, but in this branch problems similar to those already referred to arise. Competent wiremen are the result of long apprenticeship and the work of labourers in the industry is too heavy for most women. Nevertheless there is a possibility that conditions, particularly the raising of the "reservation" age for electricians, may make it necessary to employ women and the matter is to be considered by the N.J.I.C. for the Electrical Contracting Industry. This brief survey of the position leads to the conclusion that while there are many directions in which women can be employed in industry it is doubtful whether it is possible, generally speaking, to admit them in large numbers to the supply and contracting branches of the electrical industry within reasonable time. The provision of proper training facilities might eventually change the situation, but that remains to be seen.

The Purpose of Science

ADDRESSING the Royal Society the other day, Sir William Bragg expressed concisely one of the issues raised in our last week's leader. Scientists, he said, do not claim that they ought to be entrusted with authority on the ground that they are scientists; what they do hold is that authority should be exercised in the light of a knowledge that is growing continuously and with continual effect on politics, on industry and on thought itself. That, surely, is not asking too much. The least we can expect of those who aspire to govern is that they should be mentally equipped to understand the potentialities, for good and ill, of the engineering productions which are due to scientific discoveries and that they shall have the character to wish to use them in the service and not to the detriment of the public.

Conditions of Employment

REFERENCE has been made in these pages to the effect of the Conditions of Employment Order upon electricity supply authorities who have hitherto refused to follow the recommendations of the National Joint Industrial Council for the industry. In a recent address at a conference arranged by the Midland Sectional Board of the Electrical Contractors' Association, Mr. L. C. Penwill, Director of the Association, made it clear that any electrical contractor, whether or not a member of the E.C.A., was breaking the law if he did not pay the wage rates laid down by the N.J.I.C. for the Electrical Contracting Industry, and any cases of the kind should be reported. Mr. Penwill also hoped, as we did when welcoming the Order on its publication, that this wartime measure would be preserved after hostilities had ceased.

An E.P.T. Inequity

IN a letter to *The Times* last week Mr. C. F. Richards, managing director of Morphy-Richards, Ltd., drew attention to the serious effect which the 100-per-cent. Excess Profits Tax was likely to have upon a young and rapidly-expanding business. He said that his company was formed in 1936 and made a striking advance during the second two years of its life for reasons in no way connected with the war. Yet, because in its first two years (1936–37 and 1938) it earned a small profit, this is used as a basis for the levying of the tax, with the result that the company finds itself called upon to pay 19s. 3d. in the pound, which will have a crippling effect. Mr. Richards even says that it may be necessary to close the business down in view of the company's failure to secure redress. If this case is at all typical it indicates that little regard is being paid to the necessity for allowing a new company reasonable "development" time until the order of its profit can be properly ascertained. If the company was making its money out of the nation's wartime needs the case would be entirely different, but Morphy-Richards have been making domestic appliances.

Cables and Bombs

WE have previously commented on the way in which electric cables in contrast to other public service mains have stood up to aerial bombardment. A good example reported in the *Post Office Electrical Engineers' Journal* relates to the effects of a bomb dropped on a grass verge slightly to one side of the track of a 122-pair telephone cable, the road being artificially elevated and having a concrete foundation and a kerb. Both duct and cable, together with the edge of the roadway, were lifted by the force of the explosion and a block of concrete fell on the cable forcing it into the 31-ft. diameter crater to a depth of 10 ft. below the road surface. Although the duct was demolished, the cable in the crater sustained no harm beyond a few cracks in the sheathing. In the manhole on one side of the damage the anti-creepage device with which the cable was fitted held firmly, but the pull of the core and its rebound caused the cable to move 6 in. away from the explosion, severely crimping the sheath at which point three faulty pairs were found, the remainder continuing in service. On the other side of the fault, where the cable was free to move in the direction of the crater, the cable at the nearest manhole was drawn 2ft. 3in. towards the crater. The deductions to be drawn from this event, which are confirmed in the article on page 125 of this issue, may bring some comfort to those responsible for the maintenance of cables generally.

Pulverised-Fuel Engines

GIVEN clean enough coal, it would appear from experiments being carried out at the Fuel Research Station, Greenwich, that the rates of wear of the interior parts of Diesel engines converted to operate with pulverised coal can be reduced to quite practicable proportions. In his report for the year ended last March, now published, Dr. F. S. Sinnatt, the director, shows that by employing a chromium-plated cylinder liner, the wear in the case of the engine considered was reduced to one seventieth of that of an ordinary cast-iron liner. At the same time the wear of the cast-iron piston and rings was also considerably less. In view of the difference in cost of pulverised fuel and Diesel oil, the cost of preparing the coal seems a relatively small matter and would be well worth while if it made it feasible to run internal combustion engines for the production of electricity on home produced coal instead of on imported oil.

REPAIRING AIR-RAID DAMAGE

How supply is being maintained under difficulties

Electricity supply is being kept going, in spite of repeated air-raids, by the magnificent work of the staffs and the co-operation of neighbouring undertakings. Lengthy breakdowns are practically unknown.

ONE of the most striking features of the air-raids in this country has been the way in which the electricity supply system has stood up to the test. Gas, water, public transport and communication services have all been incapacitated to varying degrees, but it is a matter of general comment how well electricity supplies have been maintained. It is true that many areas have been without electricity for short periods ranging from a few seconds to perhaps 10 or 20 minutes, but there has been a remarkable absence of the prolonged and widespread failures which might well have been anticipated. Even in the most badly damaged areas local supplies to individual streets or houses have not generally been interfered with for longer than a day, and it is safe to say that with practically no exceptions any consumer wanting a supply has been able to have it within a very few hours—certainly as soon as he could get other "first aid" for his premises.

Above: An example of the conditions under which 6.6-kV cables have continued to function. Right: Building up a crater to re-lay cable duct

The way electricity supplies have been maintained has, in fact, surpassed even the most optimistic expectations, and both the country and the public generally owe the industry and its personnel a deep debt of gratitude. The much-criticised grid scheme has shown its value and even in the cases where this has temporarily broken down the ingenuity and mutual co-operation of the local engineers, coupled with their foresight in providing the maximum number of alternative sources of supply and distribution, have succeeded in tiding the service over its difficulties.

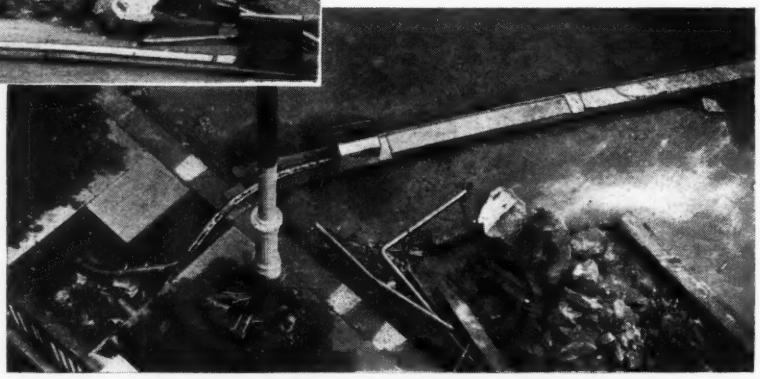
With regard to actual individual instances of bomb damage to electrical equipment and transmission and distribution systems we have been surprised on making an inspection to discover how localised trouble has been in most cases and how well apparatus has withstood harsh treatment. When a bomb hits a roadway, in a very large number of instances, both the gas and water mains are fractured. The immediate result of this is a failure of the gas and water supplies to the adjacent area, but further troubles subsequently await the gas undertaking as a result of water getting into the pipes, even as far as the consumers' meters. Electric cables on the other hand, show themselves able to take an amazingly large amount of maltreatment. They are bent, stretched and twisted into almost unbelievable shapes without failure and the worst damage usually occurring is the drawing out of the cable from the nearest disconnecting box—a matter soon put right by means of a short joint to take up the slack.

Though stretched across a crater several feet these 6,600, 2,000, and 200-V cables went on working

Substations, too, seem to be able to take a good deal of punishment. Often the buildings themselves may be badly damaged, but the fact that the plant carries on its duties speaks well for its robustness and workmanship. At one of the factories we visited the

substation equipment had actually fallen from the first to the ground floor and was still operating.

In practically all cases repair work is carried out in two stages—what may be termed "first aid" (the temporary restoration of supply), and the more permanent tidying up afterwards, in both cases much ingenuity and skill being displayed in improvisation. Speed in rehabilitation of supplies and keeping abreast not only of the repair work but also of new emergency installation required are, however, the primary considerations, and time and labour difficulties inevitably make it necessary to forgo quite the same standard of installation to which we have been accustomed. Cab-tyre cable and cleating are, for instance, being employed largely for cooker installations and, while this may not be considered to conform to the standards thought necessary in peacetime, it does answer its purpose and is perfectly good enough for the present. If need be it will last several years without serious deterioration and after all, the almost negligible risk of injury to the consumer may well be ignored in the face of the far greater perils which he is called upon to meet daily.



How a 6.6-kV cable was diverted round a bomb crater to replace a damaged section

In these efforts to keep electricity supply going, there is one feature which stands out above all others. This is the devotion to duty of the undertakings' staffs, most especially the repair gangs. It is not merely a question of almost continuous stretches of duty with few opportunities for sleep, but often a matter of real heroism. The repair gangs are frequently called out in the middle of the night with bombs actually falling around them to restore urgently needed supplies, and it is no uncommon event for them to work with unexploded bombs as their companions.

Incidentally, supply undertakings have a grievance in the slowness and inadequacy of the demolition squads and of the road repair gangs. In one case to which our attention was drawn three men had been working on a bomb crater for a month. Without knowing the full facts of the case and of the urgency of the repair it is difficult to form any idea of the justification for this delay, but it is to be hoped that as the arrangements for handling such emergencies as this progress, hindrances of this kind will be overcome.

Though their heroism is not so spectacular we have nothing but admiration for the power station and control room staffs who carry on their work unflinchingly day and night, knowing full well that the buildings they occupy are not only landmarks but also objectives which the enemy would very much like to destroy. Depressing, too, to say the least of it, is the lot of the power station engineers and boiler house operators, who, when their black-out arrangements have been damaged, have to keep their stations running and perhaps clear up débris as well by the light of torches only.

Metallised Glass Heaters

ALUMINIUM and its alloys adhere closely to hot cleaned glass when sprayed by a Schoop gun in the form of wire. Heaters formed of zig-zag aluminium strips connected in series on the insides of two toughened glass plates mounted back to back have been made by Pilkington Bros., Ltd., and tests carried out by the Research Department of Metropolitan-Vickers Electrical Co., Ltd. indicate satisfactory adhesion of the resistor element and ability to withstand shocks associated with switching on and off. The samples tested, rated at 1,000 W at 250 V, were run on load for 1,600 hours with a time cycle of two hours on and one off. No appreciable change in loading took place and the leakage current on load was less than 1 mA.

In order to limit the temperature of the glass to the permissible maximum of 140 deg. C. the loading with two glasses back to back should not exceed about 150 W per sq. ft. At normal voltages the smallest capacity practicable would be about 750 W with aluminium and 500 W with alloy. For hand spraying, the metal strips should not be less than $\frac{1}{4}$ in. wide with a minimum distance apart of $\frac{3}{16}$ in. but with mechanical control of the gun these figures can be considerably reduced. The glasses must be mounted at least $\frac{1}{2}$ in. apart.

Presumably because the sprayed metal consists of discrete drops, each in an oxide envelope, its resistivity is about ten times as high as when in the usual wire form. The change of resistance of aluminium with temperature is about 29 per cent. between 20 and 150 deg. C.

Maps by Wire

IT is reported by *The Times* that the Second Canadian Divisional Signals are adapting commercial facsimile transmission to military purposes. The machines employed resemble modern teletype machines. Maps, sketches, and written or printed matter can be transmitted over regular wire or radio circuits. It is claimed that the system is a scientific application of commercial equipment to army needs, and that it provides speed, accuracy and variety. The machines operate over any available speech channel. Copy is reproduced on the receiving machine at the rate of 16 sq. in. a minute, and typescript can be sent at the average rate of 160 words a minute.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE marriage took place on November 29th of **Mr. A. G. B. Colyer,** only son of Dr. and Mrs. Arthur Colyer, and **Miss Pamela Muriel Hirst,** daughter of the late Lieut. H. Hirst and of Mrs. C. Dreyfus and granddaughter of Lord Hirst. Mr. Colyer, who was educated at Marlborough, held an important position in the Export Department of the General Electric Co., Ltd., before he was called up for service with the colours as a member of the Territorial Army on the outbreak of the war. He went to France with the B.E.F. and was with those who were evacuated from Dunkirk. He now holds a commission and is serving with an A.A. battery.

Mr. and Mrs. Colyer, after their wedding at Chelsea Old Church

Miss Hirst, a member of the staff of the Electrical Association for Women for a considerable period, is also serving with the Women's Auxiliary Territorial Service. The marriage ceremony was performed at Chelsea Old Church, by the Rev. R. E. Sadleir. The bride was given away by her uncle, Captain L. C. Gamage, M.C., and the best man was Mr. E. F. W. Fighiera.

Among those present at the ceremony were Lord Hirst, the Hon Mrs. Gamage, the Hon Mrs. Trevor Rose, Mr. and Mrs. M. J. Railing, Mrs. N. Railing, Mr. and Mrs. Dickson Moyse, Dr. and Mrs. A. Colyer, Miss Peggy Colyer, Sir Frank and Lady Colyer, Mr. and Mrs. W. A. Valon, Mrs. Valon, Miss Moses, the Marquess of Queensberry, Miss C. Haslett, Mr. E. Middleton, Mr. I. V. Tyler, Capt. Cole-Adams, Dr. and Mrs. Lyle Cameron, Miss Leckenby, Miss Flato, Mr. and Mrs. S. M. Costello, Mr. L. Costello, Dr. Ackner, Mr. Black Hawkins, and Messrs. A. Hawthorne, H. W. Adams, F. Eggleton, A. Griggs, E. W. Hann, A. E. Jepson, T. B. O. Kerr, W. Lewis-Smith, H. W. Leonard, F. C. Mayes, M. R. Neville, F. E. Rowland, T. Settle, V. H. Vale and S. C. Wells.

Two brothers who have served the General Electric Co., Ltd., for a period, between them, of a hundred and four years, have just retired. They are **Mr. E. G. Baker** who joined the company in 1883, and **Mr. H. C. Baker** (1893). Each of them joined the company when it was a small selling organisation and have played a valued part in its growth to a great manufacturing enterprise. Throughout their careers, their activities have been connected with head office affairs.

Except for a few early years Mr. E. G. Baker—the doyen among the Magnet House staff—was associated with the Wires and Cables Department, and it is doubtful if any individual in the country acquired a more comprehensive knowledge of the history and development of this section of the industry during the past half century. Mr. H. C. Baker first served—in the pioneer days of the G.E.C. when quartered at Queen Victoria Street—in a small department which now deals with the company's multitudinous products embraced in what is termed "electrical accessories." Thence he was transferred to the Order Department, with which he remained connected to the date of his retirement.

Edinburgh Corporation Public Utilities Committee on Nov. 29th recommended the appointment of **Mr. J. F. Field,** B.Sc., A.M. Inst.C.E., A.M.I.E.E., as deputy engineer and manager of the Electricity Department. The commencing salary is £700 a year, rising by £50 a year to £1,000. Mr. Field is in the chief engineer's department of the Central Electricity Board. He has had considerable experience in the design and construction of generating plant and is a graduate of Edinburgh University.

Gold watches and long service certificates were recently presented by G. & J. Weir, Ltd., to **Messrs. A. Williams** and **H. Dyer** on their completion of fifty years' service at the Cathcart works. Sir John Richmond, K.B.E., J.P., who congratulated the recipients, said that there were now nine members of the staff with fifty years' service to their credit, and eight of them were present on this occasion. Mr. C. R. Lang was prevented from attending, much to his regret. Sir John Richmond, who has himself completed 51½ years' service with G. & J. Weir, said that the nine veterans were still working hard and their combined service was now 462 years.

Capt. A. J. Beckett, M.I.E.E., borough electrical engineer of Bridlington, has retired on account of ill-health. It will be recalled that he was due for superannuation on January 1st, 1939, but his appointment was extended by the Town Council. After receiving his technical training at King's College, London, the Brush Electrical Engineering Co., Ltd., and the Nottingham University, Capt. Beckett joined the Brush Company, for whom he acted as central station and equipment contracts engineer. He subsequently held the successive positions of mains and street work superintendent, with British Insulated Cables, Ltd., assistant to Mr. Crummie, consulting engineer, Bedford, assistant engineer in the Belfast Corporation Electricity Department, and chief assistant in the York Corporation Electricity Department. He went to Bridlington in 1904. During the last war he served with the Royal Engineers and in the Navy. Capt. Beckett has represented Group "C" on the National Joint Industrial Council for the Electricity Supply Industry and was a member of the Area Committees of E.D.A. and I.M.E.A. **Mr. F. R. Hobley** (mains superintendent) has been appointed by the Council to take charge of the technical side of the electricity undertaking, and **Mr. W. F. Brown** (commercial manager) will be in charge of the commercial and clerical side.

Capt. A. J. Beckett

We are pleased to hear that **Mr. Mark Whitgift,** the hon. secretary of the Batti-Wallahs' Society, has now so far recovered from his serious illness as to be able to walk in his garden. He has hopes of being fit for light work in the New Year.

Alderman Dudley Stuart, M.I.E.E., vice-chairman of the London and Home Counties Joint Electricity Authority has been appointed chairman in succession to Alderman J. Chuter Ede, M.P., who relinquished office on his appointment as Parliamentary Secretary to the Board of Education. Alderman Dudley Stuart, who has been vice-chairman of the Authority for six years, is well known both in electrical and municipal circles. He has been a member of Wimbledon Corporation for thirty-three years, has twice been mayor and is an honorary freeman of the borough. On the business side of his career, he was well known for his work in the engineer's head office of the National Telephone Co., where he was in charge of design, specification and testing of cables and wires. He subsequently performed similar duty for the Post Office and added to his responsibilities the testing of submarine cables. He was noted for his work as a pioneer in a design of paper-insulated submarine cables. Alderman Dudley Stuart is a vice-president of E.D.A.

Alderman Dudley Stuart

Mr. Peter F. Bennett, chairman of Joseph Lucas, Ltd., has been adopted as National Government candidate by the Executive Committee of the Edgbaston Division Unionist Association to fill the vacancy caused by the death of Mr. Neville Chamberlain. Mr. Bennett is a past-president of the Federation of British Industries and is at present assisting Lord Beaverbrook in the Ministry of Aircraft Production.

Mr. C. H. Sparks, M.A., M.I.E.E., A.M.Inst.C.E., chief engineer, and **Mr. C. K. F. Hague,** A.M.I.Mech.E., A.M.I.E.E., general sales manager of Babcock & Wilcox Ltd., have been appointed to the board of directors of the company to fill the vacancies occasioned by the deaths of Engineer Vice-Admiral Sir Robert B. Dixon, K.C.B., and Mr. C. S. Davy.

Mr. W. H. Duffett, borough electrical engineer of Rotherham, is the chairman of the South Yorkshire Mutual Aid Group whose formation we reported last week. The vice-chairman is **Mr. T. W. Hibberd,** Doncaster.

Sergt. D. Haigh, who was recently awarded the Distinguished Flying Medal, was an estimating clerk with the English Electric Co., Ltd., before he joined the R.A.F. about two years ago.

Sergt. David Roberts, a former employee of the Bournemouth & Poole Electricity Supply Co., has also been awarded the D.F.M.

Mr. W. Holttum, M.Eng., chief assistant to the chief engineer of British Insulated Cables, Ltd., and chairman of the Mersey & North Wales (Liverpool) Centre of the I.E.E. for last session, was married recently to Miss Clare Douglas, of Manchester.

Manchester Corporation Electricity Committee has expressed appreciation of the services of **Mr. L. H. Marlor,** installation engineer, who has retired under the age limit.

Mr. J. Tilling, B.Sc., A.M.I.E.E., lecturer in electrical engineering of the Constantine Technical College, Middlesbrough, has been appointed head of the Department of Electrical Engineering at Chesterfield Technical College. Mr. Tilling was with the Burnley Electricity Department from 1925 to 1934.

Mr. W. C. C. Hawtayne, M.I.E.E., consulting engineer, has temporarily removed his offices to 55, The Pryors, Hampstead, N.W.3.

Mr. D. B. Hoseason, M.I.E.E., M.I. Mech. E., chief engineer of the Motor Department of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, has joined the Brush Electrical Engineering Co., Ltd., and has been appointed to the board of that company.

Mr. G. H. Pulfrey, general manager and engineer of the St. Helens Corporation transport undertaking, is recommended by the Hull Transport Committee for the position of general manager of the city's transport undertaking. Before going to St. Helens, Mr. Pulfrey was the chief engineer of the Nottingham system.

Mr. A. J. C. DeRenzi has been presented with a silver cigarette case to mark his completion of thirty-five years as borough electrical engineer of Newcastle-under-Lyme. The presentation was made by Mr. J. R. Gandy, chief assistant in the Electricity Department, on behalf of the staff and workmen.

Mr. Price F. White, who retired recently from the position of borough electrical engineer of Bangor, North Wales, has been presented with a cheque and a large framed photograph. Local residents were associated with the presentation, which was made by Councillor T. Williams, chairman of the Electricity Committee. The photograph is to be hung in the Council Chamber. Mr. White has also received a gold signet ring from the heads of departments of the borough.

Obituary

Mr. C. P. Sparks.—We regret to report that Mr. Charles Pratt Sparks died on December 7th, after a long illness, at the age of seventy-four. Mr. Sparks was educated at Repton School and later entered the Hammond Electrical Engineering College (now Faraday House). In 1884 he became an engineering pupil in the workshops of the Ferranti-Hammond Company and was subsequently appointed assistant to Mr. (later Dr.) S. Z. de Ferranti, who was then developing his system of high-voltage distribution with transformers.

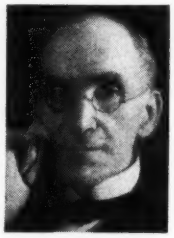
He entered into partnership with Ferranti & Francis Ince in 1887, the firm carrying on business as S. Z. de Ferranti & Co. in London and Paris, and he was a director of Ferranti, Ltd., until 1899. From 1886 to 1891 he had charge, under Ferranti, of the Grosvenor Gallery lighting station and distribution mains and he supervised the erection of additional plant in the station. During this period the business was transferred to the London Electric Supply Corporation and while the Deptford station was being erected Mr. Sparks supervised the laying of the first 10,000-V transmission main and the equipment of the main substation.

He left the London E.S. Corporation in 1891 to become works manager to the Ferranti Co. and in this capacity he carried out contracts for the manufacture and erection of engines, alternators and electrical equipment for many power stations. He became chief engineer of the County of London Electric Supply Co. in 1899 and subsequently acted as engineer-in-chief. In 1899 he also set up a consulting practice in partnership with his brother Captain H. C. Sparks, and carried out a great deal of work in connection with the erection of industrial power plants covering collieries, metalliferous mines and mills in Great Britain, the United States, India and other parts of the Empire. He was associated with the St. James' and Pall Mall Electric Lighting Co. for many years, and was at one time chairman and acting managing director.

Mr. Sparks entered the Institution of Electrical Engineers as a student in 1885. He became an associate member in 1899 and a full member in 1905. He served on the Council of the Institution from 1900 to 1907 and was vice-president from 1907 to 1909. He was elected President in 1915 and served for two years. Several of the I.E.E. committees had the advantage of his experience; he was chairman of the Wiring Rules Committee for fifteen years. He was also a member of the Engineering Standards Committee (now the B.S.I.), as well as representing the I.E.E. on that body.

Mr. Sparks was awarded the C.B.E. for his services during the last war.

Mr. C. H. Yeaman.—In our last issue we briefly announced the death of Mr. Charles Henry Yeaman, who until March this year was city electrical engineer at Stoke-on-Trent. Born in Glasgow in 1869, Mr. Yeaman was educated at the High School, Glasgow, Morrison's Academy, Crieff, and Glasgow University and Technical College. He received his practical training with Anderson & Munro and James White, of Glasgow. In 1888 he took charge of the works of the Ward Electric Car Co., Ltd., London, and a year later was appointed an electrical engineering inspector to the Liverpool Corporation. From there he went to Prescot in 1891 as an electrical engineer to the British Insulated Wire Co., Ltd., and a year later he came south to take up the position of editor-in-chief of *Industries and Iron*. He went to Islington in 1895 as chief accountant and deputy engineer to the Borough Council, and in 1905 began his long association with Stoke-on-Trent, where he was at first electrical engineer to the Hanley Borough Council, and upon the creation of the County Borough of Stoke-on-Trent he was selected from the then four engineers to combine and manage the electricity supply undertaking.



The late Mr. C. H. Yeaman

Up to the time of his retirement Mr. Yeaman was consulting engineer to the North-West Midlands J.E.A. and a member of the Council of the I.M.E.A. He was also chairman of the Area Engineers' Committee and of the E.D.A. Circle, and was also on the Industrial Heating Committee of E.D.A. For nearly thirty years he was lecturer in electrical engineering for Hanley to the Stoke Education Committee. In his early days he was a contributor to the ELECTRICAL REVIEW and his first letter to us appeared in our pages in the '90s, the subject being his tests of the first paper cable in this country. He had also rewritten Maycock's "Electric Lighting and Power Distribution," which was re-issued in 1937. Mr. Yeaman was a member of the I.E.E.

Mr. E. Moxon, former borough electrical engineer of Southport, died recently at the age of sixty-one. Mr. Moxon was born in Huddersfield and was trained at the town's electricity works. He was appointed deputy electrical engineer at Blackburn in 1906 and thirteen years later became borough electrical engineer of South Shields. He went to Southport as borough electrical engineer in 1921, but retired six years later on account of ill-health. He leaves a widow, a son and a daughter.

Mr. C. R. Lang.—We regret to record the death, on December 3rd, of Mr. Charles Russell Lang, C.B.E., senior director of G. & J. Weir, Ltd. Mr. Lang joined the company in 1887 as works manager, subsequently becoming a director and joint managing director. Educated at Anderson's College, Glasgow, and the Royal College of Science, London, with the distinction of being a Whitworth Scholar, Mr. Lang served his apprenticeship with his family firm of John Lang & Sons, machine tool makers, Johnstone. In his association with G. & J. Weir, Ltd., Mr. Lang had taken a leading and responsible part in carrying out successful developments in the company's products, organisation and departmental arrangements. For his work for the Government in the last war he was awarded the C.B.E. in 1918. Mr. Lang, is survived by his wife, a son and two daughters.

Mr. T. Kennen, of Kirkby Lonsdale, whose death is reported, was for twenty years associated with the Chloride Electrical Storage Co., Ltd. He retired from the position of sales engineer about eighteen months ago on account of ill-health.

The death occurred on November 19th, of **Lieut.-Col. James Anderson,** of Anderson Boyes & Co., Ltd., Motherwell.

Will.—The late **Mr. G. W. Partridge,** who was a director of a number of electricity supply companies, left estate valued at £16,281 (£15,389 net personality).

Lamps as Resistances

AS supplies of carbon-filament lamps are now restricted, tungsten filament lamps are being used (and with equal success) as resistances, e.g., for charging small accumulators. The following table, drawn up by the General Electric Co., Ltd., compares the resistance values of the "Osram" single-coil gas-filled lamps with those of "Robertson" carbon lamps. A variation of as much as 10 per cent. in the resistance of lamps does not affect detrimentally the charging process. At the same time the resistance figures shown in the above table are correct only when the lamps concerned are run at their rated voltages. If the voltage is reduced the resistance of a tungsten-filament lamp decreases, whereas that of a carbon-filament lamp increases.

Volts	Ohms for carbon lamps		Ohms for tungsten lamps			
	16 c.p.	32 c.p.	60W	75W	60 & 75W in parallel	150W
200	626	300	665	534	296	267
210	690	334	724	586	324	294
220	758	362	810	646	360	322
230	829	398	880	708	392	352
240	895	433	960	767	426	384
250	976	470	1040	835	463	416

Tyre Inspection by X-Rays

A NEW fluoroscopic device which permits the X-ray examination of tyres without the need to remove them from the cars is described in the *Fleet Owner*. By this method the presence of metal, glass and stones embedded in the rubber can be detected by the garage attendant. The X-ray output is such that accurate inspection of up to eight-ply white side-wall tyres can be made, although white side walls, which contain zinc oxide, are more opaque to radiation than ordinary black walls. Only a single electric light outlet is required for operating the unit, which can be moved about on rollers. Push-button control enables the workman to mark on the tyre defects observed on the viewing screen as the wheel is slowly turned.

BEET SUGAR PRODUCTION

Extensive Use of Electricity

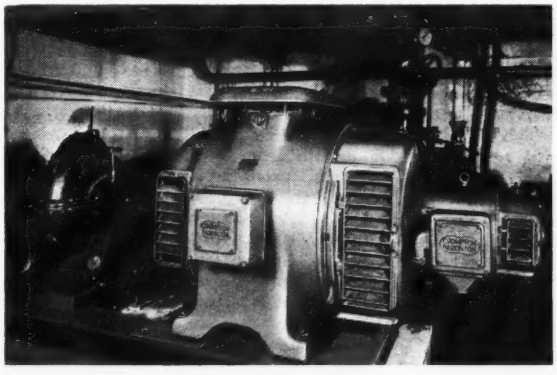
A 3,200-kW works generating station provides power for a number of large motors employed in this factory of the British Sugar Corporation

SUGAR produced from beet grown in England this season will be sufficient to provide London with the present sugar ration for twelve months. The sugar extraction process can be observed in the following account of the modernisation at a factory of the British Sugar Corporation, Ltd., which, having found it necessary to re-equip this factory both from a process and an electrical point of view, entrusted the provision and installation of the electrical equipment to Crompton Parkinson, Ltd.

Private generation is employed, and, because of the large steam requirements for process heating and the fact that the production periods extend only over about a quarter of the year, it is difficult to see how this supply problem can be improved upon. Although there are a few steam drives in the factory, mainly in connection with CO_2 pumping, most of the machinery is driven by electric motors and the additional machines installed amount to 1,878 BHP. The supply for these machines is taken from the power station from two 1,150-kW and two 450-kW turbo-alternators, operating at 380 V, 3-phase, 50 cycles, 0.8 power factor.

Low-voltage distribution switchboard at one of the British Sugar Corporation's works, controlling two 1,150-kW alternators, two 450-kW alternators and various outgoing feeders

Owing to the increased load and the installation of additional turbo-alternators, the existing switchboard was replaced by switchgear of suitable design to deal with the fault kVA. Oil switches with a breaking capacity of 25 MVA were installed, and so as to limit the fault kVA to this value a bus-tie reactor was employed, and the generating plant split up so that it is not possible for the fault kVA at any one point to reach a value in excess of 25 MVA.



This auto-synchronous motor installed on the centrifugal water pump is designed to operate at leading power factor of 0.8, to assist in the correction of power factor of the whole building

The new switchboard consists of enamelled slate mounted on angle-iron framework for wall and floor fixing, the back of the board being arranged in cubicle fashion so that each breaker is separated from its neighbour by sheet steel partitions, and also sheet-steel partitions between the air break isolators and the oil switch. The busbars are completely protected, and a switching arrangement is provided in the run of the busbars so that in an emergency the bus-tie reactor can be disconnected. All the instruments fitted are of the flush type.

The two centre panels of the board are taken up with the automatic voltage regulator equipment and the exciter regulators and field switches for the alternators. The instruments included on the alternator control panels are integrating kWh meter, indicating kW meter, power factor indicator, ammeter, voltmeter and three single-pole reverse power relays together with a voltmeter selector switch for reading the voltage between each phase and neutral. The overload protection consists of a current transformer operated direct-acting overload trip coil short-circuited by time limit fuses, the same protection being applied to the outgoing feeder panels which are of the standard type, with one ammeter.

The conditions under which some of the motors operate are particularly difficult and dirty. The loading is also continuous as once the factory starts receiving the beet the process is carried on for twenty-four hours a day until the supply of beet is exhausted. Included in the new equipment is a 40-BHP 720-RPM drip-proof motor, the purpose of which is to drive a bucket wheel for lifting the beet into the wash mill at the reception end of the factory where the beets are received in water ducts from the storage silos, or, as they are unloaded from the lorries.

The beets are thoroughly cleaned in the wash mill, which is driven by a 60-BPH, 725-RPM motor and are then conveyed to the top of the factory by elevators. Here they are delivered to the slicing machines which are driven by an 80-HP, 735-RPM motor. This motor operates three slicing machines. The fourth slicing machine is driven by a 40-BHP, 1,440-RPM squirrel-cage "Tork" type motor operating through a centrifugal clutch. The dirty water is removed from the factory by a centrifugal pump, driven by a 60-BHP,480-RPM vertical spindle,drip-proof machine.

A Crompton auto-synchronous motor installed on the centrifugal water pump was designed to operate at a leading power factor of 0.8, so as to assist in the correction of the power factor of the entire factory. The use of electricity is continued to the final stage of packing, Crompton motors being also used in the sugar stackers which handle 2-cwt. bags.

Lathe Chucks for Australia

A WELL-ESTABLISHED firm in Sydney, New South Wales, wishes to secure the sole agency for an English manufacturer of lathe chucks. Hitherto the market has been dominated by chucks of Continental and American manufacture but altered conditions make the prospects favourable for British equipment. Payment for the goods would be made by London agents at the time of shipping.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions.

Electrical Vocabulary

I was greatly interested to read your note concerning Professor G. W. O. Howe's address on this subject. His statement, " One of the greatest difficulties in electrical engineering was that one dealt *almost* entirely with abstract conceptions," was most opportune, for I fear very few people are aware of that fact.

In my view, I think Professor Howe was modest for I would have preferred he had omitted the word almost which I have stressed above. It is, nevertheless, very remarkable that electrical practice should be so successful since, theoretically, it is based upon a scientific philosophy which is wholly abstract. This applies not only to electrical physics but to all branches of physics without exception. May I make my point clear in the interests of science : it is this—that if the entities of phenomena such as magnetism, electricity, gravitation, light, heat, etc., are not susceptible to actual measurement and examination they are necessarily abstract, and, therefore, have no existence in the realm of nature.

In view of Professor Howe's authoritative statement, there would seem to be an urgent need for the electrical industry to endeavour, even in time of war, to establish whether universal physics is not in fact founded upon one basic phenomenon, the discovery of which would automatically solve the difficulties mentioned by the Professor.

Perhaps you might invite your readers to pursue such a line of thought in relation to, say, elementary magnetism and electricity.

East Horsley, *December 5th.* CHAS. E. WHEELER.

Horses or Electrics ?

Why are horses still allowed to pull delivery vans on our streets, each eating as much as would feed two beef bullocks ? Many owners keep few figures and think only of avoiding Road Tax. It is high time the Inland Revenue authorities and the Ministry of Food attended to this big leak. An electric van using a very small amount of coal (at the power station) per day will pay road tax, save food, and be cheaper in use than any horse outfit.

Horse delivery wastes revenue by avoiding taxes. It wastes labour by taking twice as much attention. It wastes beef and mutton and especially milk by using food animals' rations. It wastes dole money at present being paid to miners.

Ormskirk, *November 29th.* VICTOR ELECTRICS, LTD.

Boiler Water Properties

A " Mechanicals " Paper

CHANGES that take place in the constitution and physical properties of steam boiler water at the higher operating pressures, together with mechanical priming and methods of preventing steam contamination by moisture and solids in suspension, are discussed by Mr. R. F. Davis (International Combustion, Ltd.) in the paper which was to be presented at the INSTITUTION OF MECHANICAL ENGINEERS in London to-day (Friday).

Nuclear boiling is shown to be the normal mode of evaporation at a submerged heating surface, but under certain conditions film boiling may take place. The size of the steam bubbles generated bears a definite relationship to the characteristics of the heating surface and to the operating pressure. During migration from the heating surface to the free water level, the bubbles grow considerably in size at low pressures, but only slightly at high pressures.

Due to these causes the average size of the steam bubbles reaching the free water level at low pressures is much greater than those arriving under the conditions of high operating pressures, unless the bubbles formed at higher pressures coalesce into larger units. The size of the bubbles reaching the surface will not be uniform, however, owing to differences in the qualities and slopes of the generating surfaces, rates of circulation in the boiler tubes, and periods of growth during migration. Nevertheless, a predominance of large bubbles reduces the probability of water drops being ejected into the steam space ; it is the small bubbles which are more likely to contribute to the carry-over of moisture in the steam.

The more dissolved solids there are in the water, the less is the tendency for the steam bubbles to coalesce ; but if the concentration of dissolved solids is kept low, the small bubbles more readily coalesce and form larger units. These large bubble units are not so likely to project water drops into the steam space upon disruption at the water level. They also induce a faster rate of circulation. It is now clear why, in order to preserve a reasonable purity of steam, a concentration of solids in the boiler water, which may prove satisfactory at low pressures, cannot be tolerated at high pressures, because it stabilises the undesirable small bubbles which are formed at high pressures.

Although the dissolved solids in boiler water do not appreciably affect the surface tension, they do influence the stabilisation of the bubbles by adsorption at the steam and water bubble interfaces. Persistent foam does not result, however, from this partial stabilisation by the dissolved salts, but is due to the presence of suspended matter, principally in the colloidal state. It is to minimise the stabilisation of foam by colloids that the proportion of caustic alkalinity must be kept low and organic matter practically excluded from boiler water. To what extent foaming is directly influenced by increase in the saturation pressure is uncertain.

Clearly, in designing a high-pressure boiler, much may be accomplished towards ensuring purity of the steam by careful design of the internal baffles and fittings. When the boiler goes into operation an additional factor must be considered. The steaming properties of the boiler water depend almost entirely on the nature of the feed water and the careful control of its chemical treatment, not only in relation to the purely chemical changes brought about, but, equally important, to the physical and chemico-physical changes.

Existing chemical treatments to protect a boiler against scale, corrosion and embrittlement are not as a rule designed to prevent steam contamination—they may even be the cause of it. Looking to the future, chemical treatment should be aimed at, which while still adequately protecting the boiler metal also ensures purity of the steam. This will only be achieved by giving due consideration to the chemico-physical reactions of the chemical treatment of the boiler water upon the physical processes of steam generation.

Remedy for Cable Corrosion

THE corrosion by electrolysis of lead-covered cables laid underground may be caused by small currents arising from natural causes which are self-propagated between areas of varying potential within the cable network ; and much more rapidly by the passage to and from the cables of large stray currents from DC traction systems which have uninsulated return rails, or by electro-chemical action between the soil and metallic conduit.

The remedy adopted by the General Post Office after large scale experiments is described in the *Post Office Electrical Engineers' Journal.* It is the insertion of insulating gaps in the sheaths by cutting 0.5 in. gaps in the lead. Each gap is then filled by wrapping under tension adhesive rubber tape to the level of the sheathing. The latter, cleaned and roughened, is then wrapped for 10 in. with even lapped layers of rubber tape, again under tension and in one length per layer. This allows a split rubber sleeve which is placed overall to seat evenly with a 0.25 in. gap between the cut faces.

A bolted metal coupling, painted inside and out, fits over the rubber sleeve with spacing washers between the flanges. The whole fitting makes a water-tight joint. Complete insulation of the two sides of such gaps is maintained by the removal of bonding, re-arrangement of branching cables and the insulation of brackets with special tape. In this way the sheath of a length of cable liable to attack car be isolated electrically.

A large number of these gaps have been fitted in the London region. Sheath currents of 2 A are frequently encountered in the vicinity of traction systems, the potential difference between cable and earth ranging from 30 to 150 mV (positive) while several hundred mA is not uncommon in sheaths (of cables in earthenware conduit) that are in physical contact with others in isolated sections of metallic conduit.

RULES FOR ELECTRICAL MINING—III

Present Code and Royal Commission's Proposals

By J. A. B. Horsley, O.B.E., M.I.E.E.

THE proposals of electrical import of the Royal Commission on Safety in Coal Mines may be compared in effect with existing statutory requirements and present practice.

It is observed from the Commission's report that " the Coal Mines Act, 1911, assigns no responsibilities to electrical and mechanical engineers." The great increase in the mechanisation of mining in general and the growing complexity of the electrical installation in particular have, by general consent, carried the subject, in details at any rate, beyond the purview of the colliery manager, who is primarily and necessarily concerned with mining problems.

It has already been explained that the engineers to whom this remark applies are men in positions of authority, but who are not appointed by, nor are they under the orders of, the mine manager. They may, however, and usually do have a deciding voice in the choice of plant, while they often do, and always should, exercise supervisory control over its installation and upkeep in working condition.

It is proper, therefore, that statutory responsibility should be assigned to them in those matters to which their *de facto* jurisdiction extends. If, however, the engineer is not to become a scapegoat for those by whom he is employed, it is necessary that he shall be invested with authority commensurate with the obligations to be transferred to his shoulders. In short, in so far as the engineer is held legally responsible for the safety of the installation, he must have a deciding voice in the choice of the plant and adequate control of the use of that plant.

Having reviewed existing regulations governing the use of electricity in mines and the recommendations of the Royal Commission on safety in Coal Mines in previous articles (Electrical Review, November 29th and December 6th), Mr. Horsley proceeds to relate them, paying particular regard to engineers' qualifications, ventilation, flameproof gear and screened cables

Colliery Electrical Staff

The report says :—" We believe that the mining industry will always have difficulty in attracting and retaining electrical staff of the requisite training and character without such improvement in status and remuneration as will enable it to compete with other electrical employment. . . . We believe that a raising of status and remuneration will automatically accompany statutory certification."

While it may have been true in 1909 that " considerations of habit and character are of greater importance in this connection than technical knowledge "—in the selection of colliery electrical staff—and it is still true to-day that " considerations of habit and character " are important, it will hardly be contended by colliery executives at the present time that those characteristics are an adequate substitute for technical knowledge and manipulative skill on the part of the men who are in the first line of defence against electrical accidents and upon whose day-to-day work the uninterrupted and efficient operation of the electrical plant so largely depends.

It is at any rate indisputable that colliery electricians have, through their representative but purely technical body, the Association of Mining Electrical Engineers, pressed for official certification and, for many years past, have held their own examinations, open to members only, and have issued certificates to successful candidates. It would now appear that the colliery electrician may at last receive the hall mark of official recognition, and it is to be hoped that this will in due season be followed by that rise in status and remuneration the desirability of which the report recognises as an important contributory to safety in the use of electricity in mines.

Standards of Ventilation

" The only record of the presence of firedamp which the law at present requires is that made in the deputies' reports under Section 64 (3) [of the Coal Mines Act, 1911] ; the reports are to be full and accurate, but there is no specific requirement that the estimated amount of firedamp found shall be recorded."

The section referred to requires that the inspection (for firedamp) shall be made with a flame safety lamp and it is necessary here to explain to the uninitiated that the presence of firedamp is detected by turning down the wick and observing whether a " cap " is produced by the burning of firedamp above the lowered flame. The percentage of firedamp that is present is estimated by judgment of the form and height of the " cap," a non-luminous flame above that due to the fuel used in the lamp. By this means it is possible to estimate, with some approach to accuracy, concentrations of from 1 to 4 per cent. If more is present the " cap " rises into the upper part of the lamp chimney and at about 4½ per cent. the flame of the burning firedamp fills the vessel. At 5 per cent., or a little more, the firedamp explodes in the lamp.

While it is obvious that this method of testing for firedamp is of little value for a scientific and systematic survey of the condition of the air throughout the mine, the flame safety lamp is still the simplest and most reliable indicator for " spot " readings, within the range of 1 to 4 per cent. of firedamp. The calibration of the " instrument " consists in turning down the wick, in fresh air, and observing the form and colour of the reduced " flame " which then takes the shape of a flat arc, or dome, with a faint blue line over the yellow eye, or centre, of the flame. The calibration is, however, constant for a particular fuel and wick.

Firedamp can be burned in any admixture with air, but it is only " explosive," *i.e.*, capable of giving rise to a self-continuing propagation of flame, within the limits of 5 to 15 per cent., approximately. The law requires that workmen shall be withdrawn from any place if the firedamp content reaches 2½ per cent. in a safety-lamp mine, or 1¼ per cent. in a naked-light mine, and forbids the use of electricity if the firedamp content exceeds 1¼ per cent. It also requires the use of safety lamps in any ventilating district in which the air current in the return airway is normally found to contain more than one-half of one per cent. of firedamp.

" The frequency of the sampling should depend on the gassiness of the ventilating district in which the samples are taken. . . . When electric power is used within 300 yards of the working face the sampling should be done daily if the content exceeds 0.75 per cent."

Electrical Measurement of Firedamp

Sampling by chemical analysis is regularly done when it is desired to obtain precise knowledge of the firedamp content of the air for a particular purpose, but it is not a routine proceeding applied to the mine as a whole. An electrical instrument has been devised, however, by means of which the firedamp content can be measured on the spot. It is based upon the principle of the Wheatstone bridge. Four spirals of platinum-iridium wire are used for the arms, one pair being enclosed and the other pair exposed to the atmosphere. The temperature to which the spirals are heated when current is passed through the bridge suffices to burn any firedamp that may be present on the surface of the exposed pair of spirals, with consequent rise in temperature and increase in resistance. The scale of the galvanometer is suitably calibrated so that the percentage of firedamp in the atmosphere is read directly from the deflection of the pointer. Due to the " ageing " of the spirals it is necessary to check the calibration by observing the scale reading when current is applied in fresh air.

This instrument was developed in France where it is known as the Léon Montlucon firedamp indicator, and it has been officially approved there since 1932. The estimation obtainable is correct within about ¼ per cent. of the true value of firedamp present over the range from ¼ to 4 per cent., which suffices for practical purposes.

Ventilation Conditions and Safety Lamps

" We recommend, therefore, that . . . no lamp or light other than a locked safety lamp shall be allowed or used in any seam unless (*a*) the seam is one in which no inflammable gas has been seen on the lowered flame of a safety lamp . . . ; or

(*b*) an exemption . . . has been granted by the district inspector. . . ."

Now the comparable requirement under Section 32 (i) of the existing Act is that safety lamps must be used if the air current in the return airway contains normally more than 0.5 per cent. of firedamp. Bearing in mind that the flame-lamp test imposes in practice a 1.0 per cent. (of firedamp) standard, it may not be obvious to those unfamiliar with coal mining conditions wherein the new basis is more severe than the old.

Let it be observed, therefore, that whereas the old basis is concerned only with the normal gas content in the general body of the air, the new basis takes into account the occasional occurrence of gas in excess of the prescribed limit in any part of the district. The point of interest and of practical importance to the electrical engineer in this matter of the use of safety lamps, will be seen in a later paragraph of this dissertation.

Ventilating Conditions and Electricity

"Under the present law no standard of ventilation is laid down to determine whether or not electricity may be introduced . . . and it is left to the divisional inspector to decide, subject to the manager's right of appeal, whether the conditions are dangerous or not. . . . It is provided, however, . . . that if at any time in any place in the mine the percentage of inflammable gas in the general body of the air in that place is found to exceed 1¼, the electric current shall at once be cut off. . . .

"The position in this respect, will, however, be fundamentally modified if our proposals for regular systematic sampling are adopted. . . . Moreover, the inspectors' general power of objection should be reinforced by a specific prohibition against the introduction of electricity within 300 yards of any working face if any one of six consecutive weekly samples . . . shows a firedamp content in the general body of the air exceeding one per cent."

It may well be asked why, if a definite standard of ventilation is to be prescribed to permit the use of electricity, it should be necessary to reserve a general power of objection on unspecified grounds. The answer is to be found in the report of the Royal Commission, in the following words: "He (the inspector) may well think the constant presence of some lower percentage (one per cent. in the general body of the air) more dangerous in the event of some unforeseen derangement of the ventilation, than the occasional presence of one per cent" (page 347).

Unforeseen, and sometimes unforeseeable, happenings cannot be excluded from the working of a colliery, but it may be hoped that the institution of systematic measurement with records of the gas content in the general body of the air will provide a basis of fact upon which to found judgment as to the admissibility of electricity.

Flameproof Electrical Apparatus

"We recommend accordingly, that in safety-lamp seams flameproof enclosure should be required for all electrical apparatus . . . installed within 300 yards of the face, and elsewhere in the seam wherever the representative gas content exceeds 0.5 per cent."

The description "flameproof enclosure" as applied to electrical apparatus is used to mean that the casing, or enclosure, is strong enough to resist an internal explosion of inflammable gas and that there are no openings at joint surfaces or spindles which will pass flame such as to ignite inflammable gas in the surrounding atmosphere. The terms of the definition adopted by the British Standards Institution, with the qualifications associated therewith, may be read in B.S. 229-1940. The condition of flameproofness is established by type tests which have been made, since 1931, by the Mines Department of the Board of Trade, unofficial testing having been carried out by Sheffield University from 1922 to 1931.

The conception of flameproof enclosure and the principle of establishing the condition by tests with explosive gas are, however, much older. Official testing has been the rule on the Continent and in the United States for many years, but until 1922 such testing was left to manufacturers in Britain and was not generally practised, with a few exceptions, when the manufacturer specialised in the production of such apparatus as coal-cutting machines.

This brief incursion into the subject of flameproof design and testing is, however, a side issue. The importance of the recommendation lies in the prescription of definite places and precise conditions, in which flameproof apparatus is permitted to be used.

"In order to prevent a fire of electrical origin from spreading, we recommend that no fixed switchgear or electric motor be installed within a prescribed distance of any inflammable material."

In relation to this recommendation it will be of interest to observe the number of instances classified as fires, originating in the various components of the electrical installations below ground in all mines, under the Coal Mines Act during the ten years 1929-1938, as shown by the following tabular record:—

Oil-immersed switches	1
,, resistors	3
,, transformers	1
Air break switches	1
Motor windings	6
Other apparatus	4
Armoured cables	18
Unarmoured single conductors	5
Rubber-sheathed flexible cables	25
Total	64

This record shows that the major risk is in cables which cannot be kept clear of inflammable material so long as timber is used extensively for the support of mine roadways, or as packing, behind and between steel arches.

Amendment of Existing Regulations

"There are, however, certain matters of general principle . . . which we think might receive the Committee's special consideration. . . ." These include (i) the use of apparatus and cables conforming to a standard not less than that in the appropriate British Standard Specification; (ii) greater stringency as to the automatic protection of circuits; (iii) the use of metallic screened types of flexible cables; (iv) application of the requirements of the Overhead Line Regulations of the Electricity Commissioners to such lines on colliery premises.

The Committee mentioned in the quotation was in fact appointed by the Secretary for Mines in 1939 under the chairmanship of the late Prof. William Cramp, whose successor is Prof. W. M. Thornton, and the mining industry will await with interest the result of its labours.

The following comments upon the four specific recommendations may be permissible:—

(i) Acceptance of British Standard Specifications as a criterion of quality is a logical corollary to active participation in the work of the British Standards Institution by the Government Department concerned. Those specifications are prepared by, or in consultation with, the interested parties.

(ii) The extent to which automatic protection in electrical circuits can be applied usefully and with ultimate economy is a subject that cannot be discussed in a few sentences. Certain applications, however, may be mentioned here as indicative of the direction in which colliery practice has been moving in recent years. Of these the most important is leakage protection, based upon the principle of cable core balance. There is no dispute, now, regarding the benefits of leakage protection, or the simplicity and reliability of its application to AC circuits, but practice has not yet crystallised as to the degree of sensitivity to be preferred or the extent to which subdivision of the protected circuits should be practised.

Electrical interlocking, as a safeguard against the exposure of dangerous live contacts, is also now generally admitted to be a wise, if not as yet a necessary, precaution. Again, the application of the principle is almost wholly confined to AC circuits for which the energy for the auxiliary circuit can readily be provided at a voltage that is innocuous. Overload or, as it is now called, over-current protection, is applied either by fuses, or by magnetic, or by thermal, trips in a circuit-breaker. In either case, the protection afforded in practice might more properly be designated short-circuit protection.

Screened Cables

(iii) Screened flexible cables are not a novelty, the so-called "Ferflex" screen having been introduced many years ago, but it is only within the last ten or fifteen years that the principle has received somewhat halting recognition from the mining fraternity. The so-called pliable armoured cable, on the other hand, with a screen in the form of stranded galvanised steel wire armouring, appears to have met with instant approval and has certainly given satisfaction where the conditions of use can be satisfied by a cable of moderate flexibility.

(*Concluded at foot of next page*)

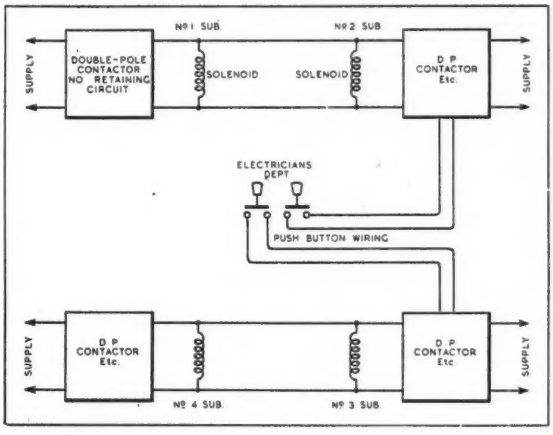
RAID PRECAUTIONS IN WORKS

Lighting and Communications Control

By H. Greaves

NIGHT bombing makes it necessary for modern works to have a quick means of extinguishing the whole of the lighting in the event of an attack, since if a portion of the roof is damaged or a number of windows are broken, any light showing will act as a guide to the enemy.

It should not be necessary to curtail the interior lighting especially where continuous production is essential to the war effort. The workers must be given a high standard of illumination together with the knowledge that in the event of an attack on



Connections for operation of solenoids on lighting circuit-breakers

the factory every precaution will be taken to ensure they are able to reach the shelters in safety. This is a case for co-operation between the works electrical engineer and all those concerned with the A.R.P. services and any scheme to be adopted should include lighting, power, and communications. The author, who has charge of an electrical plant of some magnitude, has drawn up such a scheme the particulars of which may be of interest to engineers faced with similar problems.

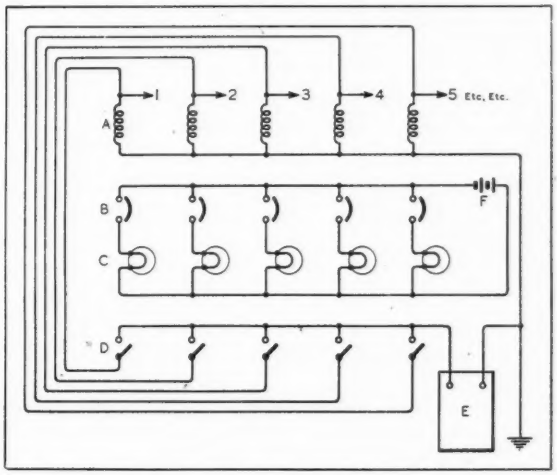
Instantaneous switching-out of the main lighting called for special treatment as the supply was given from four separate substations and the distance between each was too great to allow time for a visit by an electrician for manual switching, even if four men were available for this work. Fortunately there was a separate circuit-breaker in each substation controlling lighting and, although these did not incorporate under-voltage releases, it was possible to fit a solenoid to the overload-trip mechanism. Each pair of substations was interlinked by a twin cable and a push-button contactor fitted just inside the door of each building. In addition two push-button stations were fixed in the electrician's shop, so that it was only necessary to operate these in order to black out the whole of the factory. It was thought this additional control might be useful should a raid commence before the alert signal had been given. The feature of this arrangement is that most of the wiring is normally dead and carries current only for the short time necessary to energise the solenoids.

So far we have only considered the action necessary to confound the enemy, but we must remember that to plunge a factory into complete darkness is asking for trouble where operatives have been working in a light intensity of between 10 and 15 ft.-candles on the working plane. This is best dealt with by means of an auxiliary or pilot system of lighting (preferably supplied from a separate source) which is left on continuously day and night and of sufficient intensity to enable the workers to see their way about the factory and to find the exits when it is considered advisable to evacuate the premises. When the entire factory has been cleared this pilot lighting can be switched off if required.

Control of Power Supply

It is advisable for the control of this lighting to be effected by means of a two-way and off switch operating a contactor circuit, the three positions being "lock on," "lock off" and "normal"; the lock-on position is used during the period of evacuation and the lock-off position used when no lighting of any sort is required. The question of curtailment of power supplies depends upon the needs of the various departments: for instance, supplies to machine tools and air compressors can be interrupted, but those to furnaces, plating generators and circulating pumps should be left alone for the departmental chiefs to decide how far these processes can be carried on during a raid.

A system of communications to enable the A.R.P. officer to keep in touch with all parts of the works in order to receive reports of fires and damage need not be expensive and an installation consisting of fourteen telephones has been fitted by the author whereby messages can be exchanged between the control room and any point. From the diagram it will be seen that conversation is not possible between individual phones, so that all messages have to pass through the control room. Should the control room desire to send a common message to all posts it is only necessary to close all the switches. This will mean the saving of valuable time if it is desired to recall the workers from the shelters before the "raiders passed" signal has been sounded.



Connections for telephones with replacement type relays

A—500-ohm relay coil. B—Relay secondary contacts. C—Signal lamp. D—Single-pole switch. E—Magneto ringing telephone control room. F—4-V battery

---

Rules for Electrical Mining (*Concluded from preceding page*).

The function of the screen in either type is to interpose earthed metal between the user and the live conductors within. The value of this safeguard is enhanced where leakage protection is applied to the circuit; screened cables are, therefore, more often used for AC installations and, moreover, the need for protection from electric shock is greater with AC at about 500 V, at which such cables are used in collieries.

(iv) The Overhead Line Regulations made by the Electricity Commissioners are, by the terms of the title under which they appear, designed "for securing the safety of the public." No one can cavil, therefore, if the same structural requirements are applied to similar lines on colliery premises.

In conclusion, if apology be needed for the length of this dissertation, it may be found in the published figures of the use of electricity in mines. In 1938 there were 2,125 mines at work, of which number 1,425, or 67 per cent., used electrical power totalling 2,243,987 HP, an average of 1,575 HP per mine.

THE CONTRACTORS' ASSOCIATION

Income, Prices and Wages

AT a meeting of the Emergency Committee of the Electrical Contractors' Association, Mr. W. H. Walton, chairman of the Executive Committee, pointed out that there was a serious possibility of a decrease in the Association's income on account of war effects upon members' business. Only about 200 of the 2,000 membership appeared to have secured Government work and as a result the average subscription from the remaining members (based on the wages paid) was falling off. At the same time there was no additional income from the firms engaged in Government work. A substantial number of them were already paying the maximum subscription of 30 guineas and no matter how much their wages roll rose above £10,000 this would not mean extra revenue for the Association.

After a discussion of the subject the Committee agreed to recommend to the Council that, in respect of the year May 1st, 1941, to April 30th, 1942, the maximum subscription of 30 guineas be increased to 100 guineas, it being considered that as subscriptions were allowed by the Commissioners of Inland Revenue as a trade expense, the increase would not prejudicially affect the membership in view of the incidence of the 100 per cent. Excess Profits Duty.

War's Effect on Business

At the same meeting the Director (Mr. L. C. Penwill) referred to the number of members who had been severely hit by circumstances arising out of the war. He placed them in the following three categories :—

(*a*) Those in vulnerable areas who had been compelled to close down their businesses and were seriously affected from a financial point of view as a result.

(*b*) Those who depended on private work and had been unsuccessful in securing Government or industrial work as an alternative.

(*c*) Those who had suffered from air-raid damage as a result of which considerable loss had been sustained.

With regard to the first category, the Council had already decided that the membership could be suspended for the duration of the war, during which period no financial liability would attach to them. With regard to the second, the question had been raised as to whether or not some relief should be given by way of a reduction in subscription. The Director had pointed out to such members the Association's difficulty ; the minimum annual subscription was only £4 4s., which appeared to be rather less than the journeyman electrician paid to his trade union ; any reduction in the subscription revenue must necessarily affect the ability of the Association to carry on its work. This explanation had been appreciated by all the members concerned.

With regard to the members injuriously affected under the third heading, the Director indicated cases of hardship and said that suggestions had been made for help to be given by the Association. The claims which were likely to arise, however, might be far in excess of the Association's resources.

Something over a year ago the Council of the Electrical Contractors' Association decided to issue an instruction to its members to include in all their contracts to the value of £100 or more a clause safeguarding themselves against rises in the cost of labour and materials. The Emergency Committee of the Council has decided that this should no longer be mandatory but it has issued a very strong recommendation in favour of the continued use of the clause.

Electrical Contractors and Air-Raids

The National Federated Electrical Association has recommended to its members that the following procedure should be pursued in connection with payment of wages during the air-raid warning periods :—When a man has clocked on and is available for work during all or any of the working hours to which he is ordinarily subject, he should be paid during the period of "Imminent Danger" if work is suspended as a result, the appropriate time rate of wages which would accrue to him if he had been actually engaged in work. If a man desires to take cover upon the sounding of the "Alert" as apart from the presence of "Imminent Danger," it is recommended that no payment should be made for any work which is suspended.

It is also recommended that if a man works over the ordinary stopping time and would normally be subject to overtime payments, these payments should be made despite the fact that he had put in a short working day if such short working day arose from the suspension of work as a result of "Imminent Danger." If a man is working the ordinary day under ordinary conditions and takes shelter during working hours because of the imminence of danger, payment should be computed to the ordinary stopping time. If the "Imminent Danger" continues beyond the stopping time it is considered that this is the risk of the ordinary citizen in the circumstances prevailing and that the employer should not be called upon to pay.

If a man has been notified to work overtime and, during the period of such working day, has to take shelter because of the imminence of danger, he should be paid according to the time rate of wages scale, plus overtime if applicable, as if he had been at work. If he has not been notified to work overtime but, in fact, does so, in order to make up time lost due to taking shelter during the "Alert" period, he should be paid at ordinary rates.

Liverpool High-Voltage Laboratory

A NEW high-voltage laboratory at the University of Liverpool was opened on November 29th by Mr. B. Welbourn, chief engineer of British Insulated Cables, Ltd., and Mrs. Nisbett (widow of Mr. G. H. Nisbett, whose death we recently reported), switched on a million-volt discharge. The cost of the building has been met by the University ; the equipment has been provided by British Insulated Cables, Ltd., the late Mr. G. H. Nisbett and Liverpool Corporation, while the Metropolitan-Vickers Electrical Co., Ltd., Ferranti, Ltd., and the B.I. supplied plant on special terms.

The Vice-Chancellor, Dr. A. D. McNair, who presided over the proceedings, spoke appreciatively of the intimate relationship between the University and industry which enabled the University to fulfil its proper function. That close contact applied particularly in the Electrical Engineering Department for which Professor E. W. Marchant was responsible.

Professor Marchant said that the new equipment was designed to test insulating materials, insulators and cables at high voltages and frequencies and under all conditions. The equipment provided means of obtaining electric impulses or surges up to one million volts, which was comparable with the voltage produced by lightning discharges, on overhead lines. It was unique in the capacity of the surge generator ; others had been built for higher voltages, but there was none in existence which had as large a capacity ; this made it specially suitable for cable tests.

Mr. Welbourn remarked that whenever possible there was co-operation between the teaching staff of the University and representatives of industry and, as an instance of this endeavour to keep abreast of the times and of the trends in industry, the Department of Electrical Engineering had, since 1921, had an advisory committee of engineers representing diverse interests.

One of the major lessons of the last War was that, after the war, there would be a great international struggle for existence, and it was already emerging as one from the present war. The nations which survived and flourished would be those in which the individual members would be thoroughly equipped and trained both in regard to his or her profession, business or trade, and in regard to character and moral fibre.

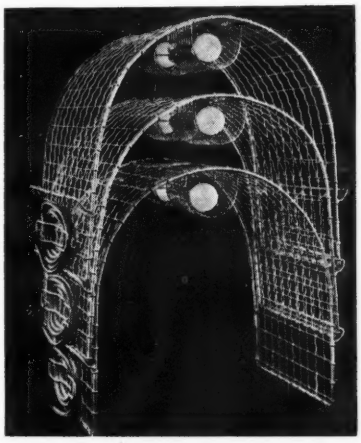
High-voltage and impulse-voltage testing combined with accurate dielectric loss measurement were becoming the everyday tools of many branches of the electrical industry and it was, therefore, highly important that the students who went out from the University should know how to handle them and interpret the results. It was the wish of the University that even closer collaboration with industry should follow those proceedings and that the new High-Voltage Laboratory would, as far as was practicable, be placed at the disposal of engineers from outside.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Heat for Shock Treatment

THE outward application of heat to counteract drop in body temperature is recognised as a first essential in the treatment of secondary shock. A convenient means of applying heat is the "Restor" cage introduced by the MEDICAL SUPPLY ASSOCIATION, LTD., 167, Gray's Inn Road, London, W.C.1. It is constructed of wire mesh in an inverted U form, being 18 in. long by 20 in. wide and 21 in. high, so that it can be placed over a stretcher, couch, or bed, and covered with blankets.



"Restor" heating cages for shock resuscitation, "nested" for convenient storage

In the arch of the cage, protected by wire guards, are twin holders for two carbon filament lamps, the wattage of which may be selected to produce the degree of heat necessary to maintain the patient's temperature; alternatively, a simple thermostat can be embodied.

A fuse is incorporated with provision for earthing and a "continuity" switch socket with safety interlock is available as an extra to enable up to ten cages to be plugged into a single 5 A outlet socket, the second connected to the first, third to second, and so on, since the loading of each is only 110 W. A double hook attachment at the side on which the rubber connecting cable can be wound minimises the possibility of entanglement.

These cages can be compactly stored by "nesting" one above the other, a channel on either side supporting those superimposed with sufficient top space between each to prevent the lamps from being damaged.

Glass Substitute

A relatively translucent substitute for glass is marketed by JAMES CLARK & EATON, LTD., Scoresby House, Glasshill Street, Blackfriars, London, S.E.1. It is a "slow combustion" material, known as "Luxoid," and is claimed not to discolour or disintegrate.

It is described as woven glass fibres impregnated with synthetic resin so as to be weatherproof and easily cleaned. It has a smooth surface that gives it an attractive appearance and it diffuses light and also acts as a screen against the glare and heat of the sun.

Although it is flexible, it seems safe enough in ordinary window sizes to withstand normal wind pressure; blast will usually dislodge it, but in one piece, so that it may be replaced immediately.

The makers claim that "Luxoid" does not break or splinter under extreme strain, but will tear in the manner of cloth; it can be cut with a sharp knife or shears. The material is whitish in colour and normally obtainable in flat sheets of stock sizes and thicknesses.

Continuous-chain Timber Saw

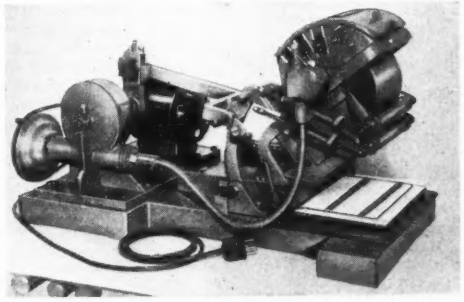
The transportable power-driven "Lynx" saw for heavy timber is a recent product of JOHN PICKLES & SON (ENGINEERS), LTD., Mytholm Iron Works, Hebden Bridge, Yorks, manufacturers of woodworking machinery.

The cutting teeth, in the form of a continuous chain, supported by a grooved bar frame, operate at a speed of 1,200 ft. per minute. The frame is straight at the top (return) edge and curved symmetrically on the bottom (cutting) edge, being deepest at the centre. Frames from 20 to 108 in. long are interchangeable in the driving head gripping device. At the opposite end of the frame is a removable guiding handle which also enables cutting pressure to be applied. The linked teeth are peculiarly formed to minimise "kick" without making an abnormally wide cut. The chain is driven by a roller-toothed sprocket wheel the spindle of which is rotated by a flat belt having a tensioning device and safety guard enclosure.

The motor is preferably of the three-phase 400/460-V type, 25/50/60 cycles, but a DC machine can be provided if desired, mounted on a light steel frame with carrying handles and a stiff quadrantal plate attached behind to form a ground rest when the machine is operated in a tilted position. For a 30-in. saw chain 3 HP is required, the weight of this size being 90 lb.; it is capable of cutting through a log of 20 in. diameter in 30 seconds.

Simplified Printing

The present need for economising in time, labour, materials and expense renders a combined offset and letterpress printing machine recently introduced by REJAFIX, LTD., 13, Bartlett's Buildings, Holborn Circus, London, E.C.1, of interest to electrical and other manufacturers. The apparatus, of which both electrical and hand-driven models are available, enables printing on



Electrically driven "Rejafix" printing machine

labels, boxes, envelopes, bottles, etc., as well as all types of electrical apparatus such as telephone switchboards, lamp bulbs, etc., to be undertaken simply and at trifling cost.

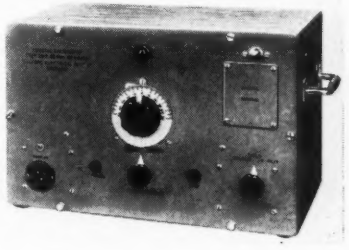
Both letterpress and offset printing can be carried out on the same machine on practically any material—paper, cardboard, Cellophane, metal foil, aluminium, glass, bakelite, porcelain, enamel, wood, etc., and two- or three-colour printing is also possible. Moreover, the shape of the article to receive the impression—flat, round or irregular—makes no difference to the effectiveness of the printing.

The extreme simplicity of construction of the machine renders maintenance or special attention unnecessary, and anyone can operate it successfully without previous experience. Up to 2,000 impressions an hour are possible on the electrically driven machine, the output of the hand-driven machines depending on the skill of the operator.

Crystal Calibrator

Notwithstanding wartime difficulties it has recently been possible for SALFORD ELECTRICAL INSTRUMENTS, LTD., Silk Street, Salford, 3, Lancs, to extend considerably that section of its manufacturing organisation which is concerned with the production of high frequency and telecommunication instruments, such as valve voltmeters, beat-frequency oscillators, signal generators, resistance measuring bridges and attenuators.

The latest addition to this range of instruments is a crystal calibrator, known as type BW 200, for radio-frequency oscillators



"Salford" crystal calibrator for oscillators and radio receivers

or receivers. It is self-contained, being designed for use off AC mains at 200/250 V and 40/100 cycles, comprising a quartz crystal oscillator with an exceptionally low temperature co-efficient for operation at frequencies of 100 kc/s, 1 Mc/s, or 5 Mc/s.

The signal is passed into a mixing valve and listening post, enabling the beats to be heard when an unknown signal is injected into the instrument. In addition another oscillator is fitted, to operate at either 25 or 500 Mc/s, which can be set to a precise value by means of the 5 Mc/s oscillator, thus serving as the datum for the accurate identification of higher frequencies.

With the aid of this instrument calibrations at frequencies above 300 Mc/s can be effected with an accuracy greater than 0.1 per cent. and, in addition, the crystal outfit is so arranged that the oscillator frequency is available for the calibration of radio receiving apparatus, or for synchronising multi-vibrators working at audio-frequencies. The whole apparatus is housed in a polished walnut case, fitted with an internal copper screen, conveniently portable as a laboratory standard and equally suitable for production work.

COMMERCIAL and INDUSTRIAL NEWS

Reservation Age of Electrical Workers. Purchase Tax on Health Appliances.

Electricians' Reservation Age Raised

THE Ministry of Labour announces that the age of reservation for certain classes of electrical workers is to be raised on January 8th. At present the reservation age ranges from 21 to 25. The categories covered by the decision are the following :—Electrician, wireman ; electrician (cinema), sound engineer ; electrician, theatre, film studio ; electrician, wireman (vehicle and aircraft) ; tester ; switchboard attendant. Electrical fitter (general hand) ; maintenance electrician, electrical engineer ; switchboard maker, erector ; transformer builder, fitter ; tester, inspector. The reservation age is raised to 30 for all these classes.

Certain employees of the radio industry are also affected. Under the heading " Wireless engineer, Mechanic " the age of reservation is raised to 35 for fault finders and testers. The age of reservation of the following telecommunication workers is also raised to 30 :—Wirer, wireman ; cable former ; cable form maker ; installer ; instrument adjuster ; system inspector ; tester, cables (telecommunication services).

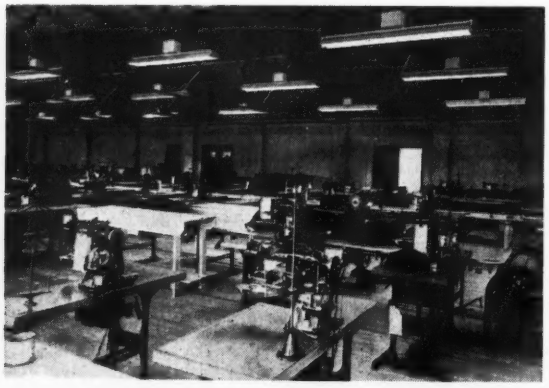
It is stated that the object of this decision is not so much to obtain men for the forces as to ensure that they are engaged on work of national importance. Employers of men affected who wish to retain them must apply by December 28th to the Government Department for which they are working or to the Ministry of Labour and National Service. Forms for the purpose can be obtained from an employment exchange.

Further Export Control

As from December 12th, as the result of an Export Control Order signed by the Board of Trade on December 4th, export licences will be necessary for the export to any destination of aircraft sound locator equipment and certain additional types of electrical measuring instruments. The Order (S.R. & O. 1940, No. 2061) is obtainable from the Stationery Office.

Lighting a Clothing Factory

Faced with the necessity for maintaining supplies of clothing on Government contracts through long hours of winter darkness, W. A. Smith & Co., Ltd., the manufacturers of " Bolenium " overalls, have solved their problem by installing 80-W " Ediswan " fluorescent discharge tubes ; their works is one of the first in the country to employ the latest source of artificial lighting on a large scale. Although the material worked on is dark and the operations close, perfect daylight conditions after blackout have resulted.



" Ediswan " fluorescent tube installation at W. A. Smith & Co.'s factory

In the main works bay 127 tubes are installed at approximately 8 ft. centres at a mounting height of about 10 ft. from the floor. The lamps are housed in " Ediswan Industra " trough reflector fittings incorporating choke units. Offices and canteens are similarly equipped, employing a further fifty tubes. The company reports that since the installation has been in operation there has been a noticeable rise in output from operatives, upon whom the moral effect of brighter working conditions has been very pronounced. The installation, which was designed by the Edison Swan Electric Co., Ltd., and installed by the County of London Electric Supply Co., Ltd., is particularly interesting because it is the first major installation ordered for the textile industry.

Maintaining Our Exports

The importance of maintaining and increasing our exports is frequently being stressed by the Government and we have often drawn attention in our pages to the efforts being made by manufacturers in this direction. A further example of the contribution being made by the electrical industry is shown in the accompanying picture which shows one of a fleet of lorries laden with G.E.C. products for overseas. The particular lorry shown is loaded with the company's radio sets destined for Calcutta, and indicates that despite the attempts of bombers to dislocate industry Britain is still able to deliver the goods.

G.E.C. radio sets *en route* to Calcutta

Purchase Tax Decisions

The Commissioners of Customs and Excise have issued a further memorandum setting out a number of decisions which they have made regarding the application of Purchase Tax to various classes of goods. In Class 7 (*b*) the following additions have been made to the chargeable items :—Ultra-violet lamps, infra-red generators, radiant-heat lamps, sun lamps and other similar apparatus designed for use in the home without professional attendance. Examples of these are radiant-heat lamps, portable or hand reflector types, or similar types, mounted on light floor or table stands, generally employing carbon or metal filament lamps not exceeding 200 W ; infra-red generators generally employing wire-wound elements not exceeding 300 W ; carbon-arc lamps of a type used for tonic purposes, sun tanning and home treatment, not exceeding 1,500 W ; and sun lamps or ultra-violet lamps, employing mercury-arc tubes or metal filament lamps for home tonic and similar use. Ultra-violet apparatus, infra-red generators, radiant-heat lamps and other similar equipment designed for hospital and professional use are not chargeable.

In Class 7 (*c*) (i), portable lamps and hand torches of all descriptions are chargeable whether or not they are fitted with batteries, accumulators or bulbs.

Limitation of Supplies

Although the Limitation of Supplies (Miscellaneous) (No. 5) Order to which we referred last week covers the same range of goods as the previous Order we think that it may be desirable to show what these are. The period covered by the new Order runs from December 1st, 1940, to May 31st, 1940, and the restriction is based on the value of goods of each class supplied during the corresponding period of 1939-40.

The electrical and allied goods affected by the Order are given below ; the restriction in each case is to 25 per cent. of the 1939-40 value :—

Class 9.—Fittings of the kind commonly used in interior lighting systems (other than industrial fittings and miners' safety lamps) of the following descriptions :—Brackets, pendants, candelabra and electroliers ; lanterns ; shades, bowls and reflectors ; and table and floor standards.

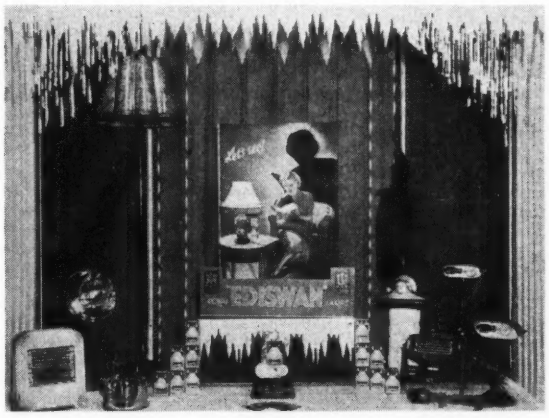
Class 13.—This includes radio-gramophones, but not radio receiving sets, sound amplification apparatus and loud speakers.

Class 17.—Domestic plate washers, fans with motors not exceeding 0.1 HP, hair-waving and hair-drying machines, laundry cleaners, washers, wash-boilers and wringers, domestic type vacuum cleaners, refrigerators (not exceeding 12 cu. ft. storage capacity), toasters, irons, plate warmers and kettles.

Export Guarantees

Necessary as it is to insure credit risks in overseas trade in time of peace, that necessity is intensified when a state of war increases the risks which exporters have to face. For this reason the work of the Export Credits Guarantee Department is of much greater importance in wartime and has had to be considerably extended to meet the new conditions. The factors which are now

operative and the methods adopted by the Department for coping with them were well set out in a recent article contributed to the *Banker* by Mr. J. H. Magowan, the Deputy-Comptroller of the Department. This has now been reprinted in booklet form and is obtainable from the offices of the Department, 9, Clements Lane, London, E.C.4.



Ediswan dealer's Christmas window display

Christmas Window Display

Under existing conditions the Christmas season will hardly be the bright and festive period of other years. Nevertheless, many stores and shops are endeavouring to recapture the spirit of peacetime and are arranging seasonable window displays. Electrical dealers will no doubt play their part, and the Edison Swan Electric Co., Ltd., is helping them to solve their problems by issuing the dealers' Christmas window display shown in the accompanying illustration.

Wartime Building Supplies

The Ministry of Works and Buildings has published a second edition of the schedule of requirements for Government Departments in relation to building supplies; the first was circulated privately. This gives sketches, dimensions and other details of many kinds of fittings for permanent, semi-permanent and temporary buildings. There is nothing purely electrical in this schedule but work is proceeding upon the compilation of another in which specifications for electric cooking equipment will be included. The schedule can be obtained from the Stationery Office at 1s. (1d. postage).

Tin Research Organisation

The International Tin Research and Development Council announces that its organisation at Frazer Road, Greenford, Middlesex, will in future be known as the Tin Research Institute, the direction and finance remaining unchanged. In addition to free technical information and advice, to assist firms undertaking tinning for war contracts, free practical demonstrations of electro-tinning, as well as the hot process, are given every Wednesday at the Greenford Laboratories.

"Electrical Review" Volumes

W. T. Glover & Co., Ltd., Trafford Park, Manchester, inform us that they have for disposal several bound volumes of the ELECTRICAL REVIEW for the period 1882-1917. We think that there may be readers who would like to acquire them and suggest that they write to Messrs. Glovers.

I.E.E. General Conditions Form

The Council of the Institution of Electrical Engineers has published a revised (December, 1940) edition of the Model Form of General Conditions C for the sale of goods other than cables, at home, without erection. Copies may be obtained from the secretary of the Institution or from the publishers, E. & F. N. Spon, Ltd., 57, Haymarket, London, S.W.1 (price 9d. each, postage extra). No additional clauses for use with these conditions during the present war have been published.

Chart Recorders

Progress made during the past ten years by the instrument-making section of the electrical industry is reflected in the recent revision of B.S.S. 90, relating to graphic recording meters of the current, voltage wattage, power factor and frequency types.

The new edition includes a graphic voltmeter having a maximum error of 1 per cent., being comparable with that of a first-grade indicating instrument. A graphic frequency meter with a maximum permissible error of one tenth of a cycle per second is also covered, such precision being required now that the mean supply frequency is so closely controlled against time. Several types of new instrument are included for the first time; for example, rectifier-operated graphic ammeters and voltmeters and iron-cored electrodynamic graphic wattmeters. Requirements covering the use of synchronous motors for driving and timing the charts have also been laid down.

Copies may be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. each (2s. 3d. including postage).

Purchase Tax on "Ekco" Lamps

E. K. Cole, Ltd., announce that arrangements have now been completed with the Customs & Excise establishing the rate of Purchase Tax on both "Ekco" and "Sirius" lamps at 21½ per cent. of list price for types up to and including 250 W. A printed schedule has been prepared showing the tax on single lamps of all types, and any dealer who has not received a copy can obtain one from the company's Lamp Sales Department, Aston Clinton, Bucks. In the case of quantities the tax is calculated at 21½ per cent. on the total list price of the purchase.

Swedish Goods for Russia

According to statements in the Swedish press, the large Swedish electrical concern A.S.E.A. has recently obtained large orders from the Soviet Union. The orders, which have a value of several million kronor, are stated to comprise practically all kinds of electrical goods manufactured by this company, such as motors, generators, relays, electric furnaces, cranes, etc. The goods have been contracted for within the frame of the recently concluded trade agreement between Sweden and the Soviet Union.

Impulse-Voltage Testing

The impulse-voltage testing specification dealing with definitions and general principles issued in 1938 by the International Electrotechnical Commission has now been published by the B.S.I. as a British Standard (No. 923-1940).

The terminology used in impulse-voltage testing is somewhat peculiar and unless the meaning of such expressions as "the time to half value of the wave-tail" is clearly defined, confusion and bewilderment will ensue. Three whole pages are therefore devoted to a section on definitions. The remainder of the document deals with the general principles of the generation of impulse voltages, the measurement of wave shapes and the measurement of impulse voltages. The standard wave shape for testing purposes is also prescribed.

Copies may be obtained from the Institution, 28, Victoria Street, London, S.W.1. price 2s. 3d. including postage.

Trade Announcements

The Bristol branch of the Sloan Electrical Co., Ltd., is now at 9, John Street, Bristol, 1 (goods entrance, 3, Little John Street), and manufacturers' catalogues are required for record purposes.

The "Mycalex" (Parent) Co., Ltd., has removed to Ashcroft Road, Cirencester, Glos. (Cirencester 400).

The head office of the Consolidated Pneumatic Tool Co., Ltd., has been transferred to Fraserburgh, Aberdeenshire (telegraphic address, "Cauking, Fraserburgh; telephone, Lonmay 243). The London District and Home Counties sales office and merchandise sales office (i.e., duff jacks, rip-bits and dresser couplings) and repair and service depots will continue to operate from 232, Dawes Road, London, S.W.6.

All communications for the Bristol branch of the Simplex Electric Co., Ltd., should be addressed to the district manager, Mr. S. G. Orchard, 22, Victoria Square, Clifton (telephone: Bristol 33592). The company states that ample stocks are available at its Cardiff and Plymouth branches.

The offices of the Jackson Electric Stove Co., Ltd. will be closed on December 25th and 26th.

Calendar

Ruston & Hornsby, Ltd., have sent us a calendar for 1941 with monthly sheets which also show the preceding and following months. Each sheet has an excellent view of places in the British Empire to which the company has supplied its oil engines.

Catalogues and Lists

Visco Engineering Co., Ltd., Stafford Road, Croydon, Surrey.—Illustrated pamphlet (403) describing the patent "Type CE" air filter with dry "throw-away" elements; also self-contained filter ventilators incorporating motor driven fans.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

WARMEX heating pads.
KOHINOOR hair dryers.
MICALAIN paint.

Makers, in quantity, of thermostats similar to those employed for domestic heating pads and blankets.

TRADE MARK APPLICATION

AMONG recent applications for British trade marks is the following, objections against which may be entered within one month of December 4th:—

TUNGUM. No. 611355, Class 9 (IV). Indoor aerials, aerials for wireless telephony, electrical contacts, etc. Tungum Alloy Co., Ltd., Iddesleigh House, Victoria Street, London, S.W.1.

ELECTRICITY SUPPLY

Shelter Lighting Plans. Eastbourne's Higher Profit. Advance in New Zealand

Ashton - under - Lyne.—A.R.P. CALLING SYSTEM.—The Town Council has decided to adopt a system of centralised "remote control," operating by means of impulses on the electricity supply mains, for calling out different sections of A.R.P. personnel when they are required for duty. The decision has been taken as a result of a visit by the Emergency Committee to Bury to inspect a similar system in operation there. The total cost of installing the plant will be about £2,000, plus £4 10s. for each receiving set in the homes of the personnel.

Bradford.—STREET LIGHTING EXTENSIONS.—The modified street lighting, which at present only covers a small area near the Town Hall, is to be extended to cover all the public transport routes, at an estimated cost of £3,280.

Burnley.—ELECTRICAL IMPULSE SIGNALLING.—Representatives of the Corporation Electricity Committee are visiting Bury to inspect its system of electrical impulse signalling on the electricity mains.

Clitheroe.—SUPPLY TO FARMS.—The Bowland District Council has approved the extension of the Corporation's mains from Newton to Slaidburn for the purpose of supplying several farms.

Colchester.—SHELTER LIGHTING.—An expenditure of £700 has been sanctioned by the Education Committee for the provision of electric lighting in eighty-two school air-raid shelters.

Derby.—WATER SUPPLY QUESTION.—In the course of a public inquiry at Chesterfield into an application by the Chesterfield & Bolsover Water Boards for permission to abstract a million gallons a day from the Derwent to meet increased industrial requirements a protest was made by the Derby Corporation, the Notts. & Derby Electric Power Co. and the L.M.S. Railway Co. Counsel for the opponents said that his clients were engaged on work which was of greater national importance than any being done by firms in the Chesterfield area and the diversion of the water would have an adverse effect upon their ability to meet the needs of important industrial concerns.

Dundee.—LIGHTING OF SHELTERS.—The Town Council is to have electric lighting installed in all public shelters.

Durham.—SHELTER HEATING.—At the request of the Ministry of Health, the County Council Assistance Committee is to install electric heaters in all shelters at institutions.

Eastbourne.—INCREASED PROFIT.—Nowadays electricity supply undertakings do not expect to be able to report a higher profit. Eastbourne is one of the favoured few, the profit of £5,878 on the undertaking being £2,703 higher than the 1938-39 figure. Although there was a 5 per cent. fall in income, the expenditure fell to a greater extent, mainly due to a smaller payment to the Central Electricity Board for bulk supply.

Enfield.—SHELTER LIGHTING AND HEATING.—The Education Committee has decided to install electric lighting and heating in the underground shelters at local schools.

Exmouth. — TERMINATION OF TARIFF AGREEMENT.—At a recent meeting of the Urban District Council it was reported that the East Devon Electricity Co., Ltd., had given notice to consumers in the district to terminate agreements under the two-part tariff. The company is to be asked for the reasons for this action, and also for particulars of any alteration in the two-part tariff which is apparently contemplated.

Glasgow.—HOUSE WIRING.—The Corporation Housing Committee is to carry out the electrical work at 480 houses on the Barrowfield estate by direct labour.

Halifax. — MAINS EXTENSIONS. — The Town Council is applying for sanction to borrow £1,000 for mains extensions.

Harrogate.—MAINS EXTENSIONS.—Application is being made by the Town Council for sanction to borrow £5,000 for mains extensions.

YEAR'S WORKING.—Although the net profit of the Corporation electricity undertaking declined from £22,555 to £8,751 last year, an allocation of £3,118 is still being made in relief of the general rates. This sum is, however, £4,750 less than in 1938-39. The total revenue was only slightly lower (£175,109, as compared with £175,178), but maintenance, etc. charges (including taxes) rose from £107,444 to £119,990, while loan charges, etc., were £1,188 higher at £46,368.

Huddersfield.—HIRING CHARGES.—As a result of the increase in the cost of electrical apparatus due to the Purchase Tax it has been resolved that the question of increasing the hiring charges for electrical apparatus affected by the tax shall be dealt with by the chairman and deputy-chairman of the Electricity Committee.

Hull.—TUBULAR HEATING IN SHELTERS.—The Emergency Committee has considered the question of heating and ventilation at shelters and has authorised the electricity department to proceed with the installation of tubular heaters in shelters which are divided into four compartments; to provide suitable vent pipes and cowls to such shelters; to proceed with experiments with a forced convection unit and report regarding the cost and success or otherwise of such unit. It was stated that the cost of the scheme was estimated at £25 per shelter for 600 shelters.

Littleborough.—ALL-IN TARIFF REVISION. As from April 1st next, the fixed charge under the all-in domestic tariff will be as follows:—First £25 of rateable value, 15 per cent.; above £25 rateable value, ten per cent. The charge is to be apportioned evenly for the four quarters. At present the fixed charge is one-third in each of the two winter quarters and one-sixth in each of the two summer quarters.

London. — BATTERSEA. — The Borough Council Electricity Committee has obtained sanction to borrow £14,750 for consumers' apparatus. Electricity services are to be provided at nine premises at a cost of £103.

LEWISHAM.—The Emergency Committee recommends that the Council should provide electric heating points, apparatus and utensils in connection with shelter heating.

WANDSWORTH.—Application has been made by the Borough Council for sanction to borrow £10,282 in connection with the conversion of street lamps to the modified form of lighting.

Malton (Yorks.).—STREET LIGHTING.—The Urban District Council has referred back for further consideration a recommendation of the Highways and Lighting Committee to introduce modified street lighting.

Manchester.—EXPENDITURE ON SERVICES.—The Electricity Committee has obtained new sanction to borrow £15,000 for services.

Mexborough.—HIGHER CHARGES.—As from January 1st the present addition of 7½ per cent. to electricity accounts will be doubled. The charge to hired-wiring consumers will be raised by a further 1d. per week to 1s. and the charges for the hire of appliances will be increased by 15 per cent.

Middlesbrough.—UNDERGROUND CABLES.—The Town Council has approved plans by the North Eastern Electric Supply Co., Ltd., for underground cables in the Cargo Fleet area, and near Connell's Wharf.

New Zealand. — INCREASED POWER SUPPLY.—Statistics of the electricity supply industry of New Zealand for the year ended March 31st, last, have been issued in the Dominion. Substantial increases over the previous year have again been recorded under all important headings, *e.g.*, one of 218 million kWh in energy generated; a revenue increase, excluding rates, of £814,000; a rise of 19,039 in the number of retail consumers; and increases in the number of ranges, water-heaters, and milking machines respectively of 13,600, (to 92,300) 15,160 (to 106,880) and 2,330 (to 27,180). The average amount of energy sold to each consumer still tended upward, the figures being 3,004 kWh for 1939-40, 2,722 kWh for 1938-39 and 2,510 kWh for 1937-38. Of the electricity generated last year, namely 2,652,109,421 kWh, no less than 1,370,985,686 kWh was sold as bulk supply; 784,875,000 kWh for domestic and commercial purposes, including water-heating; 337,622,000 kWh for electric motors; 81,547,000 kWh for dairy water-heating; and 53,322,000 kWh for tramways and railways.

Preston.—DEARER ELECTRICITY.—An increase of 5 per cent. in electricity charges as from the first meter reading after December 1st (excluding power tariffs containing a coal clause, prepayment meter consumers and hire charges for domestic apparatus) has been decided upon by the Electricity Committee. The Committee also proposes to make the domestic two-part tariff subject to a fixed charge and minimum consumption based on a minimum assessment of £10.

ANNUAL REPORT.—The annual report of the Corporation electricity undertaking shows that supplies have increased by 8½ per cent. and bulk supplies by 3 per cent., or an over-all increase of 5¼ per cent. New consumers numbered 2,373. A deficiency of £26,763 was attributed to loss of revenue from street lighting, etc., through the black-out and the extension of summer time; restrictions in the use of electricity during the early months of the war; increased rates and income tax (£24,000); increased overhead charges (£2,500); additional war expenditure (£9,000); and increased wages and salaries (£2,800). The borough electrical engineer, Mr. G. A. Robertson reports a satisfactory increase in revenue during the first three months following the end of the year under review. Under the simple hiring scheme 1,349 cookers, 1,101 water heaters, 390 wash boilers and 1,519 kettles were added during the year. Owing, however, to restrictions on capital expenditure the hire scheme for water heaters and wash boilers is to be discontinued.

LIGHTING IN SHELTERS.—At a recent meeting of the Rural District Council a letter from the County Council was read in which it was stated that electric lighting should be installed in all public air-raid shelters and that either a battery or a low-voltage system should be employed. The Rural District Council decided to obtain estimates for the work.

Rawtenstall. — PRICE INCREASE. — The Corporation is increasing its tariff for lighting, heating, and domestic purposes by 2½ per cent. as from the first meter reading next year, except to consumers supplied through prepayment meters.

Ruislip - Northwood. — SHELTER LIGHTING.—The Urban District Council has obtained approval for the installation of electric lighting in public trench shelters.

Scarborough.—COOKER LOAN.—The Electricity Committee has obtained sanction to borrow £1,500 for electric cookers.

Scunthorpe.—INCREASED CHARGES.—The "unit" charge under the domestic two-part tariff is to be increased from ½d. to ¾d. as from January 1st. With the existing tariff the borough electrical engineer estimated that there would be a deficit of £3,000 at the end of the year. The increase in charges will assist in meeting this.

Sheffield.—ANTICIPATED DEFICIT.—The estimates of the Electricity Department for the current financial year show that on the basis of existing charges a deficit of £27,796 is expected. It is reported that the Electricity Committee has considered the possibility of increasing charges, but has made no recommendation.

Stanley (Durham).—YEAR'S WORKING.—The gross profit on last year's working of the Urban District Council's electricity undertaking was £9,221, as compared with £10,721 in the preceding year. The net surplus of £789 has been added to the surplus brought forward, £4,355, making £5,144 carried forward. The balance of the reserve fund at March 31st last was £5,262.

Stoke - on - Trent. — CONTRACTORS' PRICES.—We published a note from a correspondent in our issue of November 29th to the effect that the Electricity Committee had refused a request by the local branch of the Electrical Contractors' Association for an increase from 10 to 20 per cent. in the war addition to prices for assisted wiring work and cooker wiring. We now learn from Mr. H. L. Mills, the city electrical engineer, that this was incorrect as the increase was granted and we express our regret for the error.

LOAN SANCTIONED. — The Corporation Electricity Committee has obtained sanction to borrow £3,750 for the purpose of supplying electricity to Old Wheldon Road, Fenton.

Wallasey.—PURCHASE TAX RECOVERY.—The Electricity Committee recommends that the purchase tax on articles sold on the hire-purchase system should be included in the initial deposit on the goods.

The Emergency Committee is to experiment with gas and electricity for heating shelters.

Warrington.—SUPPLY TO SEWAGE WORKS.—In connection with the electricity supply to the Howley sewage works the Town Council is seeking sanction to a loan of £1,216 for mains.

Worcester.—LOAN.—The City Electricity Committee recommends that application should be made for sanction to a loan of £17,000 to cover certain over-spending and anticipated expenditure during the next three years, in respect of transformers and substation equipment.

Worthing.—INCREASE IN CHARGES EXPECTED.—An increase in electricity charges is anticipated to meet a deficiency of £29,000 expected this year in the operation of the electricity undertaking.

TRACTION

Italy.—RAILWAY ELECTRIFICATION.—According to the Rome radio, many sections of the railway system are to be electrified under a new programme which provides for a speeding-up of electrification. Fifty-five per cent. of the Italian State railways have now been electrified, and this it is claimed, results in an annual saving of 2,000,000 tons of coal.—*Reuter.*

Manchester.—TROLLEY-BUS EXTENSION.—The Transport Committee is to replace the bus services to Chain Bar, New Moston, by trolley-vehicle operation.

South Shields.—TUBE RAILWAY PROPOSAL.—The Corporation A.R.P. Committee has rejected a proposal by Mr. E. W. Chalmers Kearney to build a deep shelter in the Mile End Road area which could be used after the war as the South Shields terminus for a proposed Kearney tube railway. It was suggested that the Government might bear the full cost of the shelter, but the Committee has decided against the proposal on the grounds that difficulty would be experienced in obtaining the necessary materials and that a long time would elapse before the land could be secured.

RADIO AND TELEPHONY

Jarrow on-Tyne.—RADIO RELAY SCHEME FOR SCHOOLS.—The Town Council has decided to obtain estimates of the cost of installing wireless rediffusion in all schools in the borough.

Blackpool.—POLICE AND FIRE WIRELESS.—Police cars, ambulances, and fire engines are to be equipped with wireless at a cost of £2,000. The equipment will be two-way, allowing the vehicles to transmit to and receive messages from a central control.

Stoke-on-Trent.—RADIO FOR POLICE AND FIRE BRIGADE.—The Corporation Watch Committee is seeking sanction to borrow £1,693 for a wireless scheme for the police and fire brigade.

Surrey.—POLICE WIRELESS.—The County Council has authorised the purchase of ten sets of loudspeaker equipment for police cars at a cost of £25 per set.

NEW BOOKS

The Dry Battery. By W. S. Sholl. Pp. 74; figs. 20. Charles Griffin & Co., Ltd., 42 Drury Lane, London, W.C.2. Price 2s. 6d.

This practical manual may be considered as divided into two halves. The first deals with the principles underlying the dry cell and with some of the methods and equipment required for its production, while the second covers actual production, testing, prevention of faults and torch accumulators.

Chapter 1 calls for no special comment, except that the author maintains that there is no practical way of reviving a spent dry cell. In addition to general principles this chapter includes an account of the dry cell and of the unspillable sack cell. Dry cells are described as "fluid bound," wet as "fluid free." In the next chapter, one is given an idea of the multiplicity of battery types, radio alone accounting for at least fifty patterns. It is pointed out that the size is not without influence on the manufacturing details such as contacts for high-tension batteries and good insulation between cells. In torch units contact depends upon whether the torch is tubular or of the flat pocket type. Mention is made of the "all dry" battery-operated receiver.

The author next gives some manufacturing information for small output of the order of 2,000 unit cells per week. The absence of power, he says, need be no deterrent to manufacture, as the whole of the work can be done by hand or semi-automatic methods. Attention is drawn to the fatigue element, which is greatest in connection with hand presses, and stand-by is recommended for workers at periods other than meal times. Attention is also drawn to the height of benches, lighting, cleanliness, the soundness of floors and the roundness of corners and to adequate ventilation. The press shop must be kept separate from other processes. While a power driven mixer is the ideal, a tumbling barrel is stated as giving satisfaction.

Further details are then given as to the essential plant required. Cost of a suitable dolly press is £15 to £50 with one mould. The capping machine is of simple type, having a single vertical punching bear. Wrapping, tying, waxing and assembling are all hand operations. On page 25 the author refers to a new "Versatile filler" of his own design. No mention is made of filler machines already on the market, and it is not obvious what the advantages of his apparatus are. Facing page 33 will be found a factory lay-out. The subject of testing is dealt with adequately and the inclusion of a chapter on torch accumulators (fluid bound, non-jelly) is noteworthy. The book cannot be said to cover large scale manufacture, but it will find a ready market owing to its modest price.—W. E. B.

Tutorial Algebra—Vol. I. Intermediate Course. By Dr. William Briggs and Prof. G. H. Bryan. Fifth edition. Revised and rewritten by George Walker. Pp. 457. figs. 56. University Tutorial Press, Ltd., Clifton House, Euston Road, London, N.W.1. Price 7s. 6d.

In view of the large amount of new matter incorporated in it the new edition of this well-known work is being issued in two volumes. This first one covers the syllabuses of the Intermediate examinations of the University of London, with the exception of intermediate economics. After considering the properties of surds, elementary ideas on complex numbers are discussed, and attention is drawn at an early stage to the properties of simple partial fractions. Particular stress is laid on functional notation, while the notion of a limit is also introduced early, with emphasis on graphical interpretation.

Rational functions are considered immediately after quadratic expressions and the graphical interpretation is again emphasised. The method of mathematic induction, a source of perplexity to many students, is elucidated by a careful selection of examples. A discussion of the binomial theorem for a positive index and of compound interest and annuities concludes the volume. Examples for exercise have been completely revised and many new ones added, largely from recent examination papers.—W.R.C.

Shorter Notice

"Engineering Economics — Book I. Elements of Industrial Organisation and Management." By T. H. Burnham and G. O. Hoskins. Fifth edition. Pp. 322. Sir Isaac Pitman & Sons, Ltd., 39 Parker Street, London, W.C.2. Price 10s. 6d.—The new edition has been completely revised. Chapters I and II on elements of economics and money, banking and exchange, have been entirely rewritten, and a new chapter on the trade cycles has been introduced. Chapters III and IV on resources and business organisations have also been reconstructed and much new matter added. The remaining chapters have all undergone considerable revision and rearrangement.

OVERSEAS ELECTRICAL NEWS

Italian Underground Power Station. New Plants for Russia and U.S.A.

Argentina. — CO-OPERATIVE POWER PLANT.—The Ayacucho Chamber of Commerce has proposed the building of a power plant for the neighbourhood to be run on a co-operative basis. The suggestion was put forward some months ago and is now under consideration. It is reported that the idea has been received with great enthusiasm by the people of the district, and as soon as a general plan has been worked out and the co-operative set up, work will begin on the new plant.

Belgium.—BRUSSELS BLACKOUT.—It is reliably learned from Brussels that the Germans have decreed that as soon as an air-raid alarm is sounded no electric lamp of any description may be used. In all apartment buildings one person is being held responsible for the application of the decree. No matter how thorough the black-out may be the lights must be extinguished. Severe terms of imprisonment are to be imposed on all who disregard the new law. It is understood that the decree follows complaints that Belgians use electric lights to guide British bombers over Belgium. Candles, gas-light or oil lamps are permitted however.

Italy.—HYDRO-ELECTRIC PLANT OPENED.—What is said to be the largest subterranean hydro-electric plant in Europe has been inaugurated at Bressanone by the Italian Minister of Communications, Signor Host Venturi. The plant, which is driven by the waters of two rivers, has been entirely built in caverns excavated in the mountains. Capable of developing about 450,000 kW, the plant will play an important part in the electrification of the railways in the Alto Adige and will furnish power for several industrial establishments in the area.—*Reuter* (Rome).

Russia.—NEW RESERVOIR AND POWER PLANT.—The Soviet newspaper *Izvestia* reports that technical plans have been completed for the building of a large water reservoir at Izyum, on the banks of the River Donetz. This reservoir, the "Ukrainian Sea," will cover an area of 86 sq. miles and will be second in size only to the "Moscow Sea." A few miles from Izyum, across the channel of the River Donetz, an earth dam about two-thirds of a mile in length will be constructed to raise the level of the water by 41 ft. A new electric power station will be constructed with a capacity of 10,000–12,000 kW.

The Donetz Basin is poor in water and the reservoir will provide the population of the district with an adequate supply. Building work will be commenced in the spring of 1941 and the scheme will be completed in three or four years. The estimated cost is 100 million roubles.

GREATER VOLGA HYDRO-ELECTRIC SCHEME.—At Kuibyshev work is in progress on a power station, the ultimate capacity of which is intended to be 3,400,000 kW. This will be the fourth station using the waters of the River Volga, the first of which is now in operation at the Ivanko Dam on the Moscow-Volga Canal. Two more, at Uglich (110,000 kW) and at Rybinsk (330,000 kW) are nearing completion.

For the Kuibyshev station it is proposed to install twenty 170,000-kW turbine-generators weighing 10,000 tons with spindles 82 ft. long by 5 ft. 11 in. in diameter. The speed is to be 83 RPM, so that the rotor, 42 ft. 8 in. in diameter, will revolve at 124 miles per hour. For machining the spindles, each consisting of three parts, lathes having centres of 57½ ft. are to be employed. Some parts of the turbine will have to be machined on specially designed boring mills 59 ft. in diameter. Preliminary estimates have shown that it will be cheaper to erect a plant locally to build the machinery than to transport it from industrial areas. It is planned to transmit energy from Kuibyshev 621 miles to Gorky, Moscow and the Urals at 400 kV.

Spain.—ELECTRICITY SUPPLY POSITION.—Senor F. Vidal Burdils contributes an article to the June issue of *Metallurgica y Electricidad*, of Madrid, on the present position and future development of the electricity supply industry of Spain. Owing to the civil war the latest official statistics are for 1935, at the end of which year the installed generating capacity of Spanish power stations was estimated at 1,479,825 kW. A diagram accompanying the article shows that the bulk of the plants are hydro-electric (about 76 per cent. of the total). Although it is estimated that a supply of electricity is now available to about 90 per cent. of the population of the country, the annual consumption per inhabitant is extremely low, amounting, according to the latest figures, to only 136 kWh.

United States.—NEW POWER PLANT.—It is learned that an additional 7,000,000 kW of power plant is scheduled for installation in the next five years by public and private utilities and the Federal Government, states *Reuter's Trade Service*. Of this total, 1,460,600 kW will be provided by the Federal Government, 500,000 kW at municipal plants and 350,000 kW at district projects; the rest will consist of private utility installations. The grand total represents an increase amounting to about one-sixth of the generating capacity in the United States at January 1st, 1940.

The Buffalo Niagara Electric Corporation, a subsidiary of the Niagara Hudson Power Corporation, is to spend about $6,000,000 on adding 80,000 kW of generating capacity to its steam power station at Buffalo.

The order for a 60-cycle steam turbo-generator has been given to the American General Electric Company. Construction of the unit will take about seventeen months, and in the meantime work is beginning on the building to take the new equipment. The unit is expected to be ready for service within two years. An important feature of the turbine is that it will be one of the first large condensing units built in a single casing and using steam at 1,250 lb. per sq. in. The unit will be cooled by hydrogen.

GAS TURBINES.—Two gas-driven turbines, the first to be built for sale by the American General Electric Co., are being made for California and Texas oil refineries. The machines will be of 3,250 and 400 HP respectively, similar to the usual steam turbine, except that they will be driven by high-temperature by-product gases which would otherwise be wasted.

RURAL POWER LINES.—The Rural Electrification Administration recently reported that requests for loans to develop rural power projects were double the amount of money available. Between July 1st and October 12th the authority allotted $60,127,000 of the $100,000,000 made available for this fiscal year, leaving less than $40,000,000 to be distributed among pending applications totalling more than $96,000,000. In a report to the Secretary of Agriculture it was stated that during the July-September quarter 30,487 miles of new power lines constructed under Federal loans were put into commission, raising the total to 263,653 miles serving 633,000 consumers.

British Empire

Canada. — ONTARIO HYDRO-ELECTRIC SCHEME.—Work will start immediately on the Madawaska River power development at a cost of $7,000,000, Dr. T. H. Hogg, chairman of the Ontario Hydro-Electric Power Commission, announced at Kingston, Ontario, recently. The Madawaska River is a tributary of the Ottawa River and the power station is to be situated about 20 miles west of the Ottawa in the Calabogie Lake district. The plant itself will cost $5,500,000 and there will be an additional expenditure of $1,500,000 for a storage at Dark Lake. Preliminary work has started at Madawaska, and the project, which will provide 54,000 HP, will be completed as soon as possible. Dr. Hogg added that with a capital investment of $20,000,000 and a total reserve of $10,000,000 the Hydro-Electric Power Commission was in a most happy position for the future. The surplus this year would be approximately $500,000. The time was rapidly approaching when it would be advantageous for Southern Ontario to merge the Niagara, Eastern and Georgian Bay power systems.

MINING PLANT.—The Mining Corporation of Canada, Ltd., is planning the construction of an electric power plant 18 miles from its Jerome mining camp, north-west of Sudbury, Ontario, to supply electricity for mining and to operate a 500-ton mill which will be erected next spring.

India. — VETERAN HYDRO-ELECTRIC STATION.—Darjeeling (Bengal Presidency) claims to possess the oldest hydro-electric station in India. *Indian Engineering* states that it was installed in 1897 when it employed the now-obsolete 83-cycle single-phase system. The conversion to 50-cycle, three-phase was begun in 1931 and was completed in 1934 at a cost of three and a half lakhs of rupees. The water supply sometimes runs short during the hot weather, and in 1938 a supplementary Diesel station with a capacity of 200 kW was installed at Lebong at a cost of a lakh and a half of rupees. The demand continues to increase, however, and estimates are being prepared for two nearby alternative sites at which a greater quantity of water is available. War conditions are likely to hamper the progress of this work, but every effort is being made to proceed with it. The supply of power to the neighbouring tea gardens is also being considered; the difficulty in this case is that the load is a seasonal one.

New Zealand.—HYDRO-ELECTRIC RESULTS.—In his annual statement for the past year the Minister of Public Works (Mr. Semple) reports the continued success of the Government's hydro-electric undertakings. The North Island system earned a revenue of £1,328,499; the operating expenses totalled £368,015, leaving a balance of £960,484. The corresponding figures for the South Island system were:—Revenue £613,612; expenditure £174,959; balance £438,653. Up to date the undertakings have met all operation, interest and depreciation charges. They have also provided £1,583,094 of the statutory sinking fund requirement of £1,835,764 and £268,447 has been contributed to reserve fund.

The demand for power has continued to increase and some difficulty has been experienced in meeting all requirements during the peak-load months. The extension of existing plants and the execution of new projects are proceeding as rapidly as present conditions permit.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

213. "Apparatus for conversion of wave motion into electrical energy, and the converse." W. J. Tennant (S. N. Shure and F. Shure (trading as Shure Bros.)). January 3rd, 1939. (529233.)

3881. "Methods of igniting direct-current high-voltage electric arcs." I. G. Farbenindustrie Akt.-Ges. February 8th, 1938. (529234.)

3882. "Methods of initiating electric arcs fed by controlled rectifiers for carrying out chemical reactions." I. G. Farbenindustrie Akt.-Ges. February 9th, 1938. (529030.)

4752. "Electric condensers, more particularly for high-frequency and wireless purposes, and processes for the manufacture thereof." F. C. Stephan and Telegraph Condenser Co., Ltd. February 14th, 1939. (529236.)

7949. "Automatic selectivity devices for tuned circuits." Marconi's Wireless Telegraph Co., Ltd., and E. F. Goodenough. March 11th, 1939. (529163.)

10797. "Manufacture of electric cells, batteries, or the like." M. R. Proudlock. April 6th, 1939. (Cognate application, 32448/39.) (529034.)

11181. "Electrical production of musical tones." A. H. Midgley and A. M. Midgley. April 13th, 1939. (529167.)

11275. "Coupling arrangements for resonant networks." Marconi's Wireless Telegraph Co., Ltd., and J. D. Brailsford. April 13th, 1939. (529168.)

12114. "Telephone systems." Automatic Telephone & Electric Co., Ltd., F. E. Comyn and E. Frydman. April 21st, 1939. (529169.)

13395. "Manufacture of electric cables." E. G. Williams, J. C. Swallow, M. W. Perrin and Imperial Chemical Industries, Ltd. May 4th, 1939. (528970.)

13538. "Telephone systems." Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker. May 5th, 1939. (528971.)

13807. "Electric circuits comprising electronic-discharge devices." A. C. Cossor, Ltd., and L. Jofeh. May 9th, 1939. (529044.)

13846. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. May 11th, 1938. (529045.)

13876. "Control valve mechanism." Wagner Electric Corporation. May 18th 1938. (529046.)

13880. "Automatic switches for use in telephone or like systems." Associated Electric Laboratories, Inc. June 20th, 1938. (529047.)

13881. "Automatic switches for use in telephone or like systems." R. Mercer. (Associated Electric Laboratories, Inc.). May 9th, 1939. (Convention date not granted.) (529048.)

13882. "Telephone or like systems." Associated Electric Laboratories, Inc. June 20th, 1938. (529049.)

14134. "Electrolytic condensers." A. H. Hunt, Ltd. September 2nd, 1938. (528977.)

14189. "Dynamo regulators." J. Lucas, Ltd., and J. A. Laird. May 12th, 1939. (529096.)

14194. "Electric time switches." C.A.V., Ltd., and V. Bedggood. May 12th, 1939. (529097.)

14235. "Selector switches for use, for instance, in telephone systems." Standard Telephones & Cables, Ltd. (G. Deakin). May 12th, 1939. (529100.)

14236. "Cooling thermionic valves." Standard Telephones & Cables, Ltd., and A. J. Maddock. May 12th, 1939. (529101.)

14238. "Methods of avoiding reflections in electric wave transmission lines." Standard Telephones & Cables, Ltd., and K. E. Latimer. May 12th, 1939. (529102.)

14242. "Wireless transmitting and receiving systems for two-way operation. W. S. Percival. May 12th, 1939. (529103.)

14332. "Arrangement of vertical-shaft centrifugal pumps with direct coupled electric driving motors." W. J. Tennant (Jonkopings Mekaniska Werkstads Aktiebolag.). May 13th, 1939. (529176.)

14400. "Overhead outdoor switchgear with improved actuating mechanism." G. Blount. May 15th, 1939. (528978.)

14576. "Band-pass filters." Marconi's Wireless Telegraph Co., Ltd., and J. D. Brailsford. May 16th, 1939. (529064.)

14654. "Electron discharge tubes." Pye, Ltd., and G. Liebmann. May 16th, 1939. (528979.)

14688. "Tools for removing the sheath from electric cables." G. M. Baillie. May 30th, 1939. (Cognate applications, 17926/39 and 19648/39.) (529066.)

14874. "Electrode salt bath furnaces." British Thomson-Houston Co., Ltd. May 18th, 1938. (528983.)

14893. "Electric meter of the frequency measuring or discriminating type." Bendix Aviation Corporation. May 19th, 1938. (528990.)

14907. "Hand and other lamps for use with electric batteries." A. J. Curnow. May 19th, 1939. (528993.)

14983. "Electric signal transmission systems." Standard Telephones & Cables, Ltd. June 11th, 1938. (529011.)

14990. "Electric control devices, particularly for tool feed motors." British Thomson-Houston Co., Ltd. May 19th, 1938. (529014.)

14992. "Gas-blast electric switches." British Thomson-Houston Co., Ltd. May 19th, 1938. (529015.)

15007. "Electrical signalling systems." Siemens Bros. & Co., Ltd., and L. S. Crutch. May 19th, 1939. (529020.)

15008. "Electrical measuring instruments." Sangamo Weston, Ltd. November 28th, 1938. (529021.)

15041. "Electric switches operated through ratchet mechanism." Ward & Goldstone, Ltd., and M. H. Goldstone. May 20th, 1939. (529068.)

15062. "Electric discharge devices." British Thomson-Houston Co., Ltd. May 27th, 1938. (529074.)

15182. "Electric fuses." British Thomson-Houston Co., Ltd. May 23rd, 1938. (529118.)

15194. "Metal-vapour electric discharge lamps." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. May 22nd, 1939. (529123.)

15214. "Control mechanism for electric range cooking units." Proctor & Schwartz, Inc. June 4th, 1938. (529129.)

15221. "Electrical filters of the piezo-electric crystal type." Marconi's Wireless Telegraph Co., Ltd., and A. T. Starr. May 22nd, 1939. (529131.)

15222. "Phase-displacing circuit arrangements." Soc. Française Radio-électrique. May 23rd, 1938. (529132.)

15238. "Electric watt-hour meters." Sangamo Weston, Ltd. December 15th, 1938. (529133.)

15271. "Contact structures for electric circuit-breakers." Westinghouse Electric International Co. May 31st, 1938. (529136.)

15320. "Electric discharge devices." British Thomson-Houston Co., Ltd. May 25th, 1938. (529147.)

15321. "Elastic fluid turbine plants." British Thomson-Houston Co., Ltd. May 26th, 1938. (529148.)

15322. "Thermal safety devices for electric heating elements." British Thomson-Houston Co., Ltd., J. H. Fella and F. A. Fossey. May 23rd, 1939. (529149.)

15367. "Electron discharge device employing successive multiple - secondary emissions." Standard Telephones & Cables, Ltd. June 29th, 1938. (529183.)

15431. "Luminescent materials." General Electric Co., Ltd., and A. H. McKeag. May 24th, 1939. (529203.)

15452. "Electric motor control systems." British Thomson-Houston Co., Ltd. May 25th, 1938. (529206.)

15453. "Tap-changing arrangements for windings of alternating-current apparatus." British Thomson-Houston Co., Ltd. May 24th, 1938. (529207.)

15454. "Magnetic apparatus for adjusting mechanism within a sealed casing." British Thomson-Houston Co., Ltd. May 25th, 1938. (529208.)

15466. "Electric heating apparatus suitable for cooking and other purposes." A. F. Berry. May 24th, 1939. (Cognate application, 18404/39.) (529211.)

15530. "Portable electrically - driven tools." Black & Decker Manufacturing Co. March 10th, 1939. (529220.)

15550. "Electric measuring instruments." British Thomson-Houston Co. Ltd. May 28th, 1938. (529226.)

15551. "Compressors." British Thomson-Houston Co., Ltd. May 28th, 1938. (529227.)

15633. "Strip tensioning devices." Westinghouse Electric International Co. May 26th, 1938. (529270.)

15653. "Disconnecting boxes, distribution pillars, and other apparatus used in electric power distribution networks." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. May 26th, 1939. (529275.)

15680. "Electrical device for checking the receiving circuits of inductor type signal repeater systems upon railways." Soc. Française Metrum. August 3rd, 1938. (529282.)

15684. "Methods of making glass-to-metal seals." British Thomson-Houston Co., Ltd. May 28th, 1938. (529283.)

15697. "Directional aerial arrays." Standard Telephones & Cables, Ltd. June 14th, 1938. (Cognate application, 15698/39). (529288.)

15704. "Ultra-high-frequency electromagnetic wave transmission." Marconi's Wireless Telegraph Co., Ltd. May 28th, 1938. (529290.)

15707. "Oscillation generators." Standard Telephones & Cables, Ltd. June 28th, 1938. (529291.)

1940

11279. "Telephone systems." Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker. May 5th, 1939. (Divided out of 528971.) (529025.)

15400. "Apparatus for making electrolyte material for electric cells." M. R. Proudlock. April 6th, 1939. (Divided out of 529034.) (529091.)

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

New Companies Registered

Holland & Caesar Ltd.—Private company. Registered November 28th. Capital £2,500. Objects: To acquire the business of electrical and mechanical engineers carried on by Edward W. Holland and Thos. W. A. Caesar at 95, Kentish Town Road, London, as Holland & Caesar. Directors: E. W. Holland, Ivy Dene, Wingrave, near Aylesbury, T. W. A. Caesar, 98, Fairway Avenue, N.W.9, and F. J. Godfrey, address not stated.

Speeds (Widnes), Ltd.—Private company. Registered December 2nd. Capital £7,000 in 7,000 shares of £1 each. Objects: To acquire the business of an electrical contractor heretofore carried on by Mrs. E. Speed at Widnes, and to carry on the business of electrical engineers, installation contractors, wireless engineers and service agents, etc. The directors are: Mrs. Elizabeth Speed, "Hillcrest," Regent Road, Widnes, Lancs, John B. Speed, "Raymead," Regent Road, Widnes, Lancs, and Wm. A. Speed, 123, Coroners Lane, Widnes. Solicitors: Poole, Swale & Co., 4, Lacey Street, Widnes.

Spreadborough Electrical, Ltd.—Private company. Registered November 23rd. Capital £100. Objects: To carry on the business of electrical and general engineers, etc. W. R. Carter, 7-8, Little Turnstile, W.C.1, is one of the first directors.

Companies' Returns

Statements of Capital

Calcutta Tramways Co., Ltd.—Capital £1,400,000 in 950,000 ordinary and 450,000 preference shares of £1 each. Return dated June 18th, 1940 (filed July 31st, 1940). 700,000 ordinary and 250,000 preference shares taken up. 8s., 10s., 14s., and £1 per share paid on 22,000, 40,000, 110,000 and 409,100 ordinary shares respectively, and £1 per share paid on 250,000 preference. £118,900 considered as paid on 118,900 ordinary shares, and 12/-, 10/- and 6/- per share considered as paid on 22,000, 40,000 and 110,000 ordinary shares. Mortgages and charges: £350,000 1st and £245,000 2nd debenture stock.

Delhi Electric Supply & Traction Co., Ltd.—Capital £200,000 in £1 shares. Return dated July 2nd, 1940. All shares taken up. £121,000 paid. £79,000 considered as paid. Mortgages and charges: Nil.

Altrincham Electric Supply, Ltd.—Capital £310,000 in 100,000 ordinary, 49,650 1st preference and 103,350 2nd preference shares of £1 and 228,000 deferred shares of 5s. Return dated July 3rd, 1940. 100,000 ordinary, 45,000 1st preference, 63,350 2nd preference shares and 228,000 deferred shares taken up. £155,350 paid on 75,000 ordinary 45,000 1st preference, 10,000 2nd preference and 101,400 deferred shares. £110,000 considered as paid on 25,000 ordinary, 53,350 2nd preference and 126,600 deferred shares. Mortgages and charges: £40,000.

Parmeko, Ltd.—Capital £15,000 in 5,000 preference and 10,000 ordinary shares of £1. Return dated July 4th, 1940. 4,500 preference and 8,500 ordinary shares taken up, £8,750 paid on 4,500 preference and 4,250 ordinary shares. £4,250 considered as paid on the remainder. Mortgages and charges: £17,623 2s. 8d.

Milton & Barton-on-Sea (Hants) Electricity Supply Co., Ltd.—Capital £25,000 in 5,000 7½ per cent. cumulative preference, and 20,000 ordinary shares of £1. Return dated April 11th, 1940 (filed October 28th, 1940). All shares taken up. £24,227 paid on 5,000 preference and 19,227 ordinary shares. £773 considered as paid on 773 ordinary shares. Mortgages and charges: Nil.

Woodstock Power Syndicate, Ltd.—Capital £10,000 in £1 shares. Return dated May 9th, 1940. 3,510 shares taken up, £3,510 paid. Mortgages and charges at date of return: £2,300 deb. Since registered: £7,000 deb. (part of a series for £10,000 issued July 15th, 1940).

Minehead Electric Supply Co., Ltd.—Capital £130,000 in 29,000 1st preference and 101,000 ordinary shares of £1. Return dated May 23rd, 1940. All shares taken up, £115,027 paid on 16,000 preference and 99,027 ordinary shares. £14,973 considered as paid on 13,000 preference and 3,973 ordinary shares. Mortgages and charges: Nil.

Kalgoorlie Electric Power & Lighting Corporation, Ltd.—Capital, £200,000 in 10/- shares. Return dated June 6th, 1940. 375,000 shares taken up, £137,498 10s. paid on 274,997 shares. £50,001 10s. considered as paid on 100,003 shares. Mortgages and charges: Nil.

Edmundson's Electricity Corporation, Ltd.—Capital £11,500,000 in £400,000 7 per cent. cumulative preference stock, £1,513,685 6 per cent. cumulative preference stock, £486,315 6 per cent. cumulative preference shares of £1, £6,750,000 ordinary stock, and 850,000 ordinary and 1,500,000 unclassified shares of £1. Return dated June 11th, 1940. All stock taken up. £3,570,400 paid on £400,000 7 per cent. preference stock, £1,250,000 6 per cent. preference stock, and £1,920,400 ordinary stock. £5,093,285 considered as paid on the remainder. Mortgages and charges: £4,267,179.

Sudan Light & Power Co., Ltd.—Capital, £500,000 in 94,000 preference and 406,000 ordinary shares of £1. Return dated June 25th, 1940. 52,000 preference and 406,000 ordinary shares taken up. £445,500 paid (£1 on 52,000 preference and 356,000 ordinary and 15/- on 5,000 ordinary shares). Mortgages and charges: £400,000.

Marconi's Wireless Telegraph Co., Ltd.—Capital £4,000,000 in 3,250,038 ordinary shares of 10s., 499,935 ordinary shares of £1, 3,250,092 unclassified shares of 10s. and 250,000 7 per cent. cumulative preference shares of £1. Return dated June 5th, 1940. 3,250,038 ordinary shares of 10s., 395,114 ordinary shares of £1 and 250,000 preference shares taken up. £1,797,484 10s. paid on 3,094,969 ordinary shares of 10s. and 250,000 preference shares. £472,648 10s. considered as paid on 155,069 ordinary shares of 10s. and 395,114 ordinary shares of £1. Mortgages and charges: Nil.

Madras Electric Supply Corporation, Ltd.—Capital £1,100,000 in 476,800 preference and 623,200 ordinary shares of £1. Return dated July 10th, 1940. 451,800 preference and 598,200 ordinary shares taken up. £944,000 paid on 398,600 preference and 545,400 ordinary shares. £106,000 considered as paid on 53,200 preference and 52,800 ordinary shares. Mortgages and charges: Nil.

Welwyn Garden City Electricity Supply Co., Ltd.—Capital £150,000 in 100,000 7 per cent. preference shares of £1 and 1,000,000 ordinary shares of 1s. Return dated July 10th, 1940. 80,000 preference and 800,000 ordinary shares taken up £126,343 3s. 9d. paid (including premiums of 6d. per share on 23,500 preference, 5s. on 300 preference and 3s. 9d. on 30,297 preference shares). Mortgages and charges: £40,000.

Walters Electrical Manufacturing Co., Ltd.—Capital £18,000 in £1 shares. Return dated July 11th, 1940. 16,875 shares taken up. £6,875 paid. £10,000 considered as paid. Mortgages and charges: Nil.

Chloride Electrical Storage Co., Ltd.—Capital £1,250,000 in £62,000 6 per cent. preference stock, £791,100 "A" ordinary stock, £297,603 "B" ordinary stock and 99,297 unissued shares of £1. Return dated July 12th, 1940. All stock taken up. £207,200 paid on £48,750 preference, £92,913 "A" ordinary and £65,537 "B" ordinary stock. £943,503 considered as paid on the remainder. Mortgages and charges: Nil.

Callender's Cable & Construction Co., Ltd.—Capital £2,300,000 in 1,500,000 ordinary, 400,000 preference and 400,000 "B" preference shares of £1 each. Return dated July 12th, 1940. 1,123,916 ordinary, 400,000 preference and 400,000 "B" preference shares taken up. £1,255,000 paid on 1,255,000 shares. £668,916 considered as paid on 668,916 shares. Mortgages and charges: £300,000.

General Accessories Co., Ltd.—Capital £3,000 in 1,580 6 per cent. preference, 920 5 per cent. preference and 500 ordinary shares of £1. Return dated July 12th, 1940. All shares taken up. £1,580 paid on 1,580 6 per cent. preference shares. £1,420 considered as paid on the remainder. Mortgages and charges: £24,500.

Walter Lambert, Ltd.—Capital £1,000 in £1 shares. Return dated July 13th, 1940. 401 shares taken up. £401 paid. Mortgages and charges: Nil.

W. E. Dove & Co., Ltd.—Capital, £3,500 in £10 shares. Return dated June 7th, 1940. 320 shares taken up. £2,000 paid. £1,200 considered as paid. Mortgages and charges, £3,800.

Cable & Wireless (Holding), Ltd.—Capital, £47,000,000 in £16,766,591 5½ per cent. cumulative preference stock, 233,409 5½ per cent. cumulative preference shares of £1 each, £6,883,103 ordinary stock, and 23,116,897 ordinary shares of £1 each. Return dated June 7th, 1940. £16,766,591 5½ per cent. cumulative preference stock, and £6,883,103 ordinary stock taken up. £23,649,694 considered as paid. Mortgages and charges, nil.

Cerrigydruidion Electricity Supply Co., Ltd.—Capital, £3,000 in £10 shares. Return dated June 8th, 1940. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Caxton Electrical Developments, Ltd.—Capital, £300,000 in 30,000 shares of £10 each. Return dated June 18th, 1940. 20,000 shares taken up. £70 paid. £199,930 considered as paid. Mortgages and charges, nil.

J. Stone & Co., Ltd.—Capital, £1,200,400 in 600,000 preference and 600,400 ordinary shares of £1. Return dated June 25th, 1940. All shares taken up. £1,200,400 considered as paid. Mortgages and charges, nil.

Mortgages and Charges

Home Appliances Ltd.—Satisfaction in full on October 21st, 1940, of debenture dated May 25th, 1936, and registered May 26th, 1936.

Industrial and Mechanical Engineers, Ltd.—Debenture dated October 31st, 1940, to secure all moneys due or to become due from the company to Barclays Bank, Ltd., charged on the company's undertaking and property, present and future, including uncalled capital (subject to debentures dated May 31st, 1939).

Henfrey (Electrical), Ltd.—Debenture charged on the company's property, present and future, including uncalled capital dated November 1st, 1940, to secure £250. Holder: P. Bernstein, 55, Jewin Street, E.C.

Increase of Capital

Petters, Ltd.—The nominal capital has been increased by the addition of £75,000, in £1 shares, beyond the registered capital of £25,000. 35,000 ordinary shares were allotted to the Brush Electrical Engineering Co., Ltd., on October 22nd, 1940.

Bankruptcies

J. Savill and **F. Roberts,** lately trading as Commercial Light, Heat & Power Co., electrical engineers, 47, Poland Street, London, W.—The public examination was held recently at the London Bankruptcy Court before Mr. Registrar Kean. The statement of affairs filed showed liabilities £465, and assets £170. Replying to the Official Receiver, Savill stated that they started business in March 1938. They traded successfully until the outbreak of war, but afterwards the business declined. Roberts confirmed the answers of his partner, and the examination was then concluded.

E. A. Kann, 61, Lansdowne Place, Hove, electrical and radio manufacturers' agent.—The public examination was held recently at the Court House, Church Street, Brighton, when the statement of affairs diclosed liabilities of £1,492, against assets of £42, leaving a deficiency of £1,450. The debtor attributed his failure to losses in connection with foreign agencies, illness and heavy travelling and entertaining expenses in connection with the business. The examination was adjourned for closing.

S. H. Holly, electrician, 4, South Street, Wareham.—Supplemental dividend of 2s. 10½d. in the £ payable at 10, Rockstone Place, Southampton.

J. O. D. James (James & Whiting), electrician, 102, Chepstow Road, Newport.—First and final dividend of 2s. 8d. in the £ payable December 18th, at 34, Park Place, Cardiff.

Liquidation

A. J. Holland & Sons, Ltd., electricians, Lucerne Mews, The Mall, Church Street, Kensington.—Particulars of the affairs of this company have been issued by the Official Receiver. The statement of affairs shows liabilities of £673, and assets valued at £16. The Official Receiver states that the company was formed in November, 1935, with a nominal capital of £100. In his opinion its failure is due to gross mismanagement on the part of the directors in carrying on the business for a period of over four years at an increasing loss. It was clear that in the absence of working capital there was no prospect of retrieving the position. As a result of meetings of creditors and shareholders held recently the Court appointed the Official Receiver as liquidator of the company.

Reports and Dividends

Crompton Parkinson & Co., Ltd.—The report to be presented at the annual meeting on December 20th shows that the net profit for the year ended September 30th last was £400,514 (against £404,903 for 1938-39). To this is added £81,392 brought in, making £481,906 (against £476,529). After paying the dividends on the preference and ordinary stock, etc., the "profits unappropriated" carried forward amount to £187,360 (against £81,392). The dividends on the ordinary and "A" ordinary shares are maintained at 15 per cent. plus a special cash bonus of 5 per cent. For 1938-39 a sum of £100,591 was transferred to the general reserve, but nothing is transferred this year.

As usual, the speech which Mr. Frank Parkinson, the chairman, proposes to deliver at the annual meeting has been circulated with the report. After paying tribute to the life and work of the late Col. R. E. B. Crompton and to the staff and workers, Mr. Parkinson says that as far as possible the increased efforts of the company have been directed in its normal directions; it has not been called upon to embark any substantial capital in the erection of plant which may serve a temporary purpose only. The net profit reported has been arrived at after providing fully for all estimated liabilities to taxation. The company has had to provide the 100 per cent. excess profits tax only for about six months of the year.

The substantial increase in net liquid assets (other than cash) amounting to £657,447 has been met out of cash resources, proving the wisdom of the directors' conservative distribution policy. It is the company's practice to make adequate reserves against all known contingencies within the year in which they arise. The directors are of the opinion that all undistributed profits should be regarded as available to meet any unforeseen charge that cannot be correctly deducted from the trading profits of the year in which it reveals itself. In this connection Mr. Parkinson refers to the retrospective effect of recent Finance Acts. The undistributed profits are also available for distribution as dividends or otherwise as the directors may recommend. For these reasons the board has decided not to transfer the past year's undistributed profits to the general reserve, but to leave them with the balance brought forward as "profits unappropriated."

For many years the development of the company's overseas connections and manufacturing capacity has been a cardinal feature of the directors' policy and they have given close attention to the best means of following it during the war and in the altered conditions which will ensue. The trend towards greater industrialisation in the Dominions seems likely to be accelerated and in the establishment and expansion of their industries the company believes it can play a useful and acceptable part in association with local interests by making its technique and experience available for the manufacture in the Dominions and India of products suited to their special requirements.

With this in mind the company has made extensions to its existing factories overseas and has become a partner in new factories making products within the range of the company's activities.

The General Cable Manufacturing Co., Ltd. proposes to pay a final dividend of 9 per cent. (against 6 per cent.) on the ordinary shares for the year ended September 30th, which, with the interim, makes 15 per cent. less tax for the year (against 12 per cent.)

Electric & Musical Industries, Ltd., reports a net profit for the year ended September 30th of £38,048, as compared with a loss of £131,968 for 1938-39. The profit is struck after providing for exceptional war expenditure and additional reserves to cover trade debtors and extra depreciation provided to meet the greater wear and tear due to overtime work. The report states that the production of radio sets has had to be curtailed following the restrictive regulations by the Board of Trade. Large orders for other goods are being executed and in July, August and September the output of the factories in England was greater than during the corresponding months of the previous year. No ordinary dividend is being paid, but the 6 per cent., less tax, preference dividend requires £15,388 leaving a balance to be carried forward of £169,652 (as against £147,992 brought in).

Ensign Lamps, Ltd., held its annual meeting on December 4th, when Mr. G. W. Fletcher (chairman), in reviewing the balance sheet for the past year said that shareholders would notice an item of £7,194 on current account with their subsidiary, Ensign Lamps (Australia) Pty., Ltd., out of which sum they had undertaken to subscribe for shares to the nominal value of £6,515. When this company got under way they expected to have a valuable addition to their earning capacity. Last year he referred to difficulties owing to the war in maintaining their stocks of raw materials and the favourable position they were in owing to the foresight of the managing directors. It was gratifying to report that the same position still held and they were to-day able to meet the steadily increasing demand for their products. They had now had over 12 months' experience of war conditions and they had been able not only to maintain, but to increase their turnover. The trading during the period since the end of their financial year revealed that they were continuing to make progress.

Sydney S. Bird & Sons, Ltd., report a profit for the year ended September 30th of £8,021, as compared with £5,037 for the preceding year. It is proposed to pay a dividend of 25 per cent., less tax, on the ordinary share, for the year, against 12½ per cent, less tax for 1938-39.

Mann, Egerton & Co., Ltd., report an increase in net profit from £22,474 to £23,252. It is proposed to pay dividends of 8 per cent. (against 6 per cent.) on the preference shares and 10 per cent. (against nil) on the ordinary shares. The amount transferred to reserve is reduced from £7,500 to £2,500. The balance carried forward is £20,039 (against £19,674).

The Telegraph Condenser Co., Ltd., is paying arrears of dividend on the 6 per cent. cumulative preference shares for the half-year to December 31st, 1939.

John I. Thornycroft & Co., Ltd., are maintaining their ordinary dividend at 10 per cent. and are transferring £67,450 to reserve. A sum of £67,653 (against £53,877) is carried forward.

The Palestine Electric Corporation has decided to defer consideration of dividend on the ordinary and "A" ordinary shares until the accounts for the full year are available. No ordinary dividend was paid for 1939 in view of the international situation and the necessity for conserving cash resources.

The United River Plate Telephone Co. is paying an interim dividend of 3 per cent. (against 1 per cent.)

The British Columbia Power Co. has declared a final dividend of 50 cents (Canadian currency) per "A" share, making $2 (same).

Engineering & Lighting Equipment, Ltd. is maintaining its interim dividend at 6 per cent.

The Sun Electrical Co., Ltd., has declared a dividend of 2½ per cent., as last year.

STOCKS AND SHARES

TUESDAY EVENING.

BUSINESS in Stock Exchange markets has been retarded, to some extent, by a sentiment of restraint caused by enemy action in the air and at sea. The pronounced firmness which had characterised the markets towards the end of last month gave way to a more subdued feeling, which led to withdrawal of the buying pressure that previously had sustained prices. Purely gilt-edged securities are maintained with notable firmness, such stocks, for instance, as the senior stocks of the Central Electricity and London Passenger Transport Boards being in consistent demand. Prices in the equipment and manufacturing list have, however, halted in their upward stride. Talk persists of the likelihood of a new form of British Government borrowing, to be announced in the near future. Dividend announcements are of curiously mixed character, some being better than expected, others creating disappointment by the lowering of distributions, due in practically every case to the increase of taxation.

Cross Currents in Home Rails

The Home Railway market is in a state of flux, opinions being divided as to the outlook. That the dividends to be announced next month will provide a high return on the junior stocks of the Home Railway companies is obvious, but whether the agreement of last spring between the railways and the Government will be amended in a manner unfavourable to the companies, is for the moment a subject of doubt. The prior charge stocks hold their ground, as noticed above, in sympathy with the robust strength shown by the prices of British Government securities. A further rise in London Passenger Transport "C" stock, following upon the improvement that has taken place over the past few weeks, has lifted the stock to 33. At this the return on the money, on the basis of the last-paid 1½ per cent. dividend, comes to hardly more than 4½ per cent. Needless to say, anticipation is looking for an increase, though caution leans to the view that a rise in dividend will not take place just yet. Southern Railway 5 per cent. preference is a point better at 83½; the preferred shows no change at 45½.

Metropolitan Assented

Another Underground Railway stock which has been coming into prominence is Metropolitan assented. The guaranteed interest on the stock is 3½ per cent. for fifteen years ending July 1st, 1948, and 3 per cent. for a further ten years after that. The guarantee is given by the Big Four railways from their share of the pooled receipts within the London Transport area. If London Transport "C" stock receives 6 per cent. for two out of three consecutive years after 1946, the guarantee expires, and £100 of Metropolitan assented automatically becomes £67 10s. Transport "C" stock on July 1st, 1958.

As Transport "C" stock stands at 33, the option is of no present value. Investment is not keen on a stock whose dividend is likely to decline, even in the course of eight years, but a few buyers have lately come into the market, and, as the stock was in short supply, the price has risen to 44¾. At this figure, the yield, on a 3¼ per cent. basis, is 7¼ per cent.

Price Fluctuations

Electricity supply shares remain very steady. Northamptons have advanced to 40s. per share. Some of the overseas issues have improved, Calcutta Electrics, for instance, to 31s. and Perak Hydro Electrics to 15s. 9d. To illustrate the ease with which investment shares are nowadays absorbed, mention may be made of a line of Victoria Falls Power ordinary that came on offer last week. The 6,000 shares were taken without causing a fall of so much as 6d. in the quotation, which remains at 68s. 9d. Anglo-American Telegraph preferred stock made further upward progress. Oriental Telephones at 2⅝ recovered the 1/16 which they lost last week. The United River Plate Telephone Co. has declared an interim dividend of 3 per cent. as against 1 per cent. a year ago.

Changes in the equipment and manufacturing group are few and insignificant. The outstanding feature is a jump of 5s. in Ericsson Telephones shares, which has lifted the price to 32s. 6d. Murex, after the recent spurt, eased off to 78s. 9d. Westinghouse Brake make a good spot at 37s. 6d., with a gain of 3s. 9d. on the week. Shares in companies engaged in the iron, steel and engineering industry show a tendency to give way.

The recent fluctuations in Ericsson Telephones shares furnish an excellent example of the way in which these price changes can puzzle the mind of the shareholder who does not know what the market conditions of the moment happen to be. Some time ago, rumours of a possible bonus issue by the Ericsson Telephone Co. came into circulation. These brought in buyers who took the shares as a speculation and whose support caused a sharp rise in the price. Nothing happening, the temporary holders, tired of their speculation, sold the shares down to 24s. The permanent proprietor possibly wondered what had made the price go up and, still more, what had sent it down again. He is probably inquiring why there should have been a sharp recovery, within the past few days, of 5s. per share. This brief explanation may serve not only to give him an inkling of the reason, but will perform the same office to shareholders in other companies, fluctuations in whose shares have caused them surprise not unmixed with an element of nervousness for which no justification exists.

Ordinary Shares on Offer

Mention of the scarcity of the supply of ordinary shares has been so frequent a subject of comment that it must tend to grow monotonous. By way of counterpoise, it may be of service to state that a few Northmet Power £1 ordinary shares are available at 32s. to yield 6¼ per cent. on the basis of the 10 per cent. dividends paid in each of the last three years. The interim dividend of 3 per cent. went against a previous 4 per cent., from which it may be inferred that a reduction in the final is not unlikely. The Northmet Power Co. is a Parliamentary company.

Another electricity undertaking which has reduced its interim dividend is the Richmond (Surrey) Electric Light & Power, of whose shares 500 are available at 20s., which would pay 6 per cent. on the money if the previous dividend of 6 per cent. should be maintained. The lowering of the interim dividend is, however, a hint that too much must not be expected from the final. The Scottish Power Co. paid the same interim dividend—2½ per cent.—this time as it did on the previous date, and 500 shares are on offer at 33s. to give a return of £4 17s. per cent. on the money, assuming maintenance of the 8 per cent. dividend which has now been paid annually for some years. The Southern Areas Co. postponed any interim payment last May, preferring to wait until the final figures were available. That the 5 per cent. dividend paid for last year will be repeated, is generally expected. Edmundson's ordinary are ex the interim dividend of 2½ per cent.

Interim Dividends

Electric lighting companies which paid the same interim dividends last spring as in the previous year, are County of London, Lancashire, Metropolitan, Clyde Valley and Altrincham. The Clyde Valley Co. is another of the Parliamentary companies which, by virtue of that title, are assumed to possess a higher status than those not included under the heading. Clyde Valley shares can be bought in the market at 33s. 6d. to pay 4¾ per cent. on the money. The 5s. deferred shares of the Altrincham Electric Supply Company give a return of 9½ per cent., assuming that the previous dividend is repeated. Some people are inclined to look for a reduction in the dividend on the last-named shares.

General Cable

The General Cable Manufacturing Co., Ltd. has declared a final dividend of 9 per cent. on its ordinary shares for the year ended September 30th last. This makes 15 per cent. for the year, and compares with 12 per cent. distributed in each of the two previous years. The chairman said at the general meeting last December, that the entire output was absorbed for some time ahead, and that they were likely to have a record year, both as regarded turnover and profit. He added, however, that the company would not benefit by any great extent, owing to additional taxation.

The 5s. ordinary shares are quoted at about 9s., but there is a narrow market in them owing to the fact that the ordinary capital is no more than £75,000. A similar amount of 6 per cent. preference shares of 10s. each makes the issued share capital £150,000. The company carries on the business of wire cable and general electrical manufacturers, specialising in all types of rubber insulated cables. Its financial position as regards net liquid assets is sound, and the chairman will have a pleasant duty in addressing the general meeting on December 20th next.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Middle Price Dec. 9	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	36/6	15	15	43/9	..	—
British Power and Light	30/–	20/–	7	7	25/6	..	5 10 0
City of London	28/–	20/–	7½	7½	21/3	..	—
Clyde Valley	38/6	24/–	8	8	33/9	..	4 14 10
County of London	43/3	21/–	10½	10½	30/9	..	6 16 7
Edmundson's:							
7% Pref.	32/–	24/3	7	7	28/3	..	4 19 1
Ord.	27/6	18/6	9	6	23/6xd.	..	5 2 2
Elec. Dis. Yorkshire	40/3	32/–	9	9	32/6	..	5 10 9
Elec. Fin. and Securities	42/–	34/6	12½	12½	38/9	..	6 15 0
Elec. Supply Corporation	48/–	39/–	12	11½	37/–	..	6 4 4
Isle of Thanet	16/–	5/6	4	4	6/–	..	—
Lancs Light and Power	33/–	21/6	7½	7½	27/6	..	5 9 1
Llanelly Elec.	21/–	17/–	5½	5½	18/–	..	6 2 5
Lond. Assoc. Electric	21/–	12/6	7	5½	13/9	..	—
London Electric	35/–	19/–	8	7	20/–	..	7 0 0
London Power Deb. Red.	105½	100	5	5	100½	..	4 19 6
Metropolitan	41/6	22/6	12	10	30/9	..	6 10 0
Midland Counties	39/–	23/3	8	8	32/6	..	4 18 6
Mid. Elec. Power	40/–	29/6	9	9	33/9	..	5 6 8
Newcastle Elec.	29/9	22/6	7	7	22/6	..	6 7 3
North Eastern Elec.:							
Ordinary	31/6	16/6	7	7	23/9	..	5 18 0
7% Pref.	32/6	25/6	7	7	28/3	..	4 19 1
Northampton	44/–	38/–	10	10	40/–	..	5 0 0
Notting Hill 6% Pref. (£10)	10½	9	6	6	9	..	—
Northmet Power:							
Ordinary	42/3	22/6	10	10	30/9	..	—
6% Pref.	29/–	23/–	6	6	26/6	..	4 10 7
Richmond Elec.	24/6	18/–	7	6	18/9	..	—
Scottish Power	38/–	24/–	8	8	32/6	..	4 18 6
Southern Areas	21/3	12/9	5	5	14/6	..	6 18 0
South London	23/3	20/–	7	7	20/–	..	7 0 0
West Devon	20/–	17/6	5	5	20/–	..	5 0 0
West Glos.	22/–	15/–	2½	4½	16/3	..	5 10 10
Yorkshire Elec.	40/–	23/6	8	8	32/6	..	4 18 6
Overseas Electricity Companies							
Atlas Elec.	4/–	1/3	Nil	Nil	1/9	..	—
Calcutta Elec.	37/–	22/6	10*	8*	31/–	+6d.	5 3 3
Cawnpore Elec.	30/–	24/–	10	10	26/3xd.	+6d.	7 12 4
East African Power	25/6	19/6	7	7	20/9	..	6 15 0
Jerusalem Elec.	24/–	15/–	7	7	17/6	..	8 0 0
Kalgoorlie (10/–)	12/6	9/6	7½	7½	11/6	..	6 10 5
Madras	26/9	21/6	8*	6*	25/–	..	—
Montreal Power	35¼	30	1½	1½	32	..	—
Palestine Elec. "A"	25/–	10/–	5*	Nil	11/3	..	—
Perak Hydro-electric	20/3	13/–	2½	6	15/9	..	7 12 4
Shawinigan Power	27¼	19	83cts.	90cts.	20	..	—
Tokyo Elec. 6%	69	52	6	6	30	..	20 0 0
Victoria Falls Power	75/9	56/6	15	15	68/9	..	4 7 3
Whitehall Investments Pref.	17/9	8/–	7½	7½	10/–	..	15 0 0
Public Boards							
Central Electricity:							
1950–70	110½	104	5	5	109	+½	4 11 9
1955–75	112½	106	5	5	110	+½	4 11 0
1951–73	107½	102	4½	4½	105xd.	+1	4 5 9
1963–93	96½	90	3½	3½	92½	..	3 15 8
London Elec. Trans. Ltd.	92	87½	2½	2½	93	..	2 15 9
London & Home Counties 1955–75	113¼	105	4½	4½	105½	..	4 5 4
Lond. Passenger Transport:							
A	116	104	4½	4½	107xd.	+1½	4 4 0
B	116	102½	5	5	104½xd.	+1½	4 15 8
C	65¼	25	1½	1½	33	+2	4 11 0
West Midlands Joint Elec. 1948–68	106½	103	5	5	105½	..	4 14 9
Telegraph and Telephone							
American Tel. & Tel.	230	176	9	9	200	..	4 10 0
Anglo.-Am. Tel.:							
Pref.	107	85	6	6	96½	+½	6 4 4
Def.	23⅜	18	1½	1½	22½	..	6 13 4
Anglo-Portuguese	22/6	10/–	8	8	15/–	..	10 13 4
Cable & Wireless:							
5½% Pref.	99¾	66	4½	5½	92	..	5 19 7
Ord.	65	27	4	4	55½	..	7 4 4
Income	99¾	93	..	..	99	..	4 0 10
Canadian Marconi $1	6/–	4/–	Nil	4cts.	4/6	..	—
Globe Tel. & Tel.:							
Ord.	32/6	21/6	7½*	6*	25/-xd.	+3d.	4 16 0
Pref.	27/9	22/6	6	6	23/9	..	5 1 1
Great Northern Tel. (£10)	20	11	20	20	12½	..	—
Inter. Tel. & Tel.	5½	2½	Nil	Nil	3½	..	—
Marconi-Marine	30/–	18/3	10	7½	19/6xd.	..	7 13 10
Oriental Telephone Ord.	2½	45/–	12*	11½*/	2⅜	+⅛	4 16 10
Telephone Props.	15/–	11/–	5	6	11/3	..	10 13 4
Telephone Rentals (5/–)	9/6	5/3	10	10	7/–	+6d.	7 2 0

Company	1940 Highest	1940 Lowest	Dividend Previous	Dividend Last	Middle Price Dec. 9	Rise or Fall	Yield £ s. d.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	4/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	11½	2	Nil	Nil	9	..	—
British Electric Traction:							
Def. Ord.	830	400	5	45	750	..	6 4 4
Pref. Ord.	169	130	8	8	140	..	5 14 3
Bristol Trams	48/6	32/6	10	8*	37/6	..	—
Brazil Traction	12½	5½	$1	50c.	5½	..	—
Calcutta Trams	24/–	16/3	8	5½	19/–	..	5 15 9
Cape Elec. Trams	18/6	16/–	5	5	17/–	..	5 17 8
Lancs Transport	35/–	27/6	10	10	35/–	..	5 14 3
Mexican Light:							
1st Bonds	36	25	5	5	30	..	—
Rio 5% Bonds	95	74	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	79	35	5	5	45½	..	10 9 10
5% Pref.	104½	59	5	5	83½	+1	5 19 9
T. Tilling	45/9	29/–	10	10	39/6	..	5 1 3
Tilling & B.A.	47/6	41/9	9*	8*	44/6	..	—
West Riding	35/–	25/–	10	10	34/–	..	5 17 8
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	10/–	15	Nil	15/–	+1/–	—
Assoc. Elec.:							
Ord.	43/3	26/6	10	10	40/–	..	5 0 0
Pref.	36/6	32/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	40/–	+½	6 5 0
Babcock & Wilcox	50/–	28/6	10	11	39/6	..	5 11 2
British Aluminium Ord.	56/–	29/–	12½	12½	41/3	−9d.	—
British Insulated Ord.	92/6	67/–	20	20	81/3	..	4 18 6
British Thermostat (5/–)	14/9	6/6	18½	18½	11/3	..	8 4 6
British Vacuum Cleaner (5/–)	12/–	4/9	40	12½	6/3	..	10 0 0
Brush Ord.	4/6	1/9	Nil	Nil	3/9	..	—
Callender's	69/–	46/–	15	15	62/6	+⅛	4 16 0
Chloride Elec. Storage	72/6	55/–	15	15	60/–	..	5 0 0
Consolidated Signal	72/6	59/–	36½	17	60/–	..	5 13 4
Crabtree (10/–)	24/9	17/6	17½	17½	22/6	..	7 15 7
Crompton Parkinson:							
Ord. (5/–)	20/–	12/–	30	20	17/6	..	5 14 3
E. K. Cole (5/–)	5/–	2/6	10	Nil	4/6	..	—
Elec. & Musical Industries (10/–)	10/3	4/3	5	Nil	7/6	..	—
Electric Construction	36/3	27/6	13½	10	27/6	..	7 5 6
Enfield Cable Ord.	56/–	40/6	25	16½	45/–	..	7 5 5
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	33/9	16/6	10	10	28/9	..	6 19 2
Ensign Lamps (5/–)	15/3	12/6	25	25	15/–	..	8 6 8
Ericsson Tel. (5/–)	39/3	23/–	25*	25*	32/6	+5/–	—
Ever Ready	28/3	16/6	30	40	25/6	..	7 16 10
Falk Stadelmann	18/3	12/6	6	7	13/9	..	10 3 8
Ferranti Pref.	25/–	22/–	7	7	23/9	..	5 18 0
G.E.C.:							
Pref.	32/6	26/–	6½	6½	30/-xd.	+6d.	4 6 8
Ord.	83/3	53/–	20	20	77/–	..	5 4 0
Greenwood & Batley	25/6	20/–	15	15	20/–	..	13 0 0
Hall Telephone (10/–)	18/6	8/9	15	10	11/3	..	8 18 0
Henley's (5/–)	21/6	12/6	20	20	18/9	..	5 6 8
4½% Pref.	21/2	20/6	4½	4½	21/3	..	4 4 8
Hopkinsons	46/9	32/6	12½	15	38/9	..	7 14 10
India-Rubber Pref.	21/–	19/6	5½	5½	20/–	..	5 10 0
Intl. Combustion	121/3	70/–	32½	32½	4½	..	7 17 9
J. Lucas	60/6	40/–	15	15	48/9	..	6 3 4
Johnson & Phillips	50/9	32/6	12½	15	45/–	..	6 13 4
Lancashire Dynamo	59/9	47/6	25	20	47/6	..	8 8 5
Laurence Scott (5/–)	11/–	6/–	15	15	7/–	..	10 14 2
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	46/6	30/–	13½	10	34/6	−6d.	5 16 0
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	86/9	52/6	20	20	78/9	−⅛	5 1 6
Pye Deferred (5/-)	9/–	6/9	25	25	8/9	..	14 5 8
Revo (10/–)	20/9	11/6	17½	5	17/6	..	2 17 6
Reyrolle	60/6	41/–	12½	12½	46/3	..	5 8 2
Siemens Ord.	23/9	15/6	7½	7½	17/6	..	8 11 6
Strand Elec. (5/–)	2/3	9d.	10	4	1/3	..	16 0 0
S. Smith (1/–)	8/–	3/6	37½	50	7/6	..	6 13 4
Switchgear & Cowans (5/–)	11/9	5/6	20	10	7/6	..	6 13 4
Telegraph Condenser (10/–)	8/9	6/3	5	..	7/6	..	—
Telegraph Construction	42/6	29/–	10	10	33/9	..	5 18 6
Telephone Mfg. (5/–)	9/–	5/–	9	9	6/–	..	7 10 0
Tube Investments	96/9	59/–	23½	23½	86/3	..	5 11 0
Vactric (5/–)	3/6	2/–	4	Nil	2/3	..	—
Vickers (10/–)	22/–	9/6	10	10	14/6	..	6 18 0
Ward & Goldstone (5/–)	19/9	12/6	20	20	12/6	..	8 0 0
Westinghouse Brake	46/–	30/6	17½	10	37/6	+⅛	5 6 8
Walsall Conduits (4/–)	26/6	17/6	55	55	23/9	..	9 5 0
West, Allen (5/–)	7/–	3/–	7½	10	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.*1

Dublin.—December 17th. Grangegorman Mental Hospital Joint Committee. Centralised steam plant, including heating, hot water, electrical, and sundry services. Plan and specification from V. Kelly, architect, 87, Merrion Square South, and quantities from F. C. Ward, 133, Griffith Avenue. (Deposit: £10 10s.) Tenders to J. J. Doyle, chief clerk, Grangegorman Mental Hospital.

New Mills.—December 30th. Electricity Department. 11,000 V switchgear. (See this issue.)

New Zealand.— WELLINGTON. —Public Works Department. January 14th. Two 3,000-kVA, 11-kV, three-phase, 50-cycle outdoor-type voltage regulating transformers and control equipment. (T.22238/40.)*

Roxburgh.—December 17th. County Council. Electrical work in 16 houses under construction at St. Boswells. Schedules from and tenders to J. R. Hume, Acting County Clerk, County Offices, Newtown St. Boswells.

South Africa.—PRETORIA.—Union Tender & Supplies Board. January 4th. Plant at Gasworks, Cottesloe: (a) One 200-kW rotary convertor and associated equipment. Alternatively (b) one 200-kW mercury arc rectifier or (c) two 100-kW mercury arc rectifiers. (d) Equipment for spare power circuit frame. (T.22424/40.)*

Orders Placed

Dundee.—Education Committee. Accepted. 420 lamps (battery operated) for school air-raid shelters (£808, wit a maintenance charge of £12 10s. monthly).—Thomas Justice & Sons, Ltd.

Durham.—County Public Assistance Committee. Accepted. Installation of wireless sets at Stockton Institution.—E. Upton & Sons. Wiring to loud speakers.—Arnold & Griffin. Installation of electric washer at Durham Institution (£116).—T. Bradford & Co.

Glasgow.—Transport Committee. Accepted. Dry cells—Siemens Bros. & Co.

Manchester.—Electricity Committee. Accepted. 400-V substation switchgear (twelve months' requirements)—Bertram Thomas (Engineers); Parmiter, Hope & Sugden. 33,000-V neutral earthing resistance.—Metropolitan-Vickers Electrical Co.

Morecambe.—Electricity Committee. Accepted. One 75-kVA and one 750-kVA transformers.—Electric Construction Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Athlone.—Rebuilding mills; Athlone Woollen Mills, Ltd.

Bakewell.—Recreation hostel, The Peak, for British Red Cross Society; H. Armitage, county director.

Blackburn.—Works extensions; Blackburn Products, Ltd., Whalley Banks.

Bootle.—Adaptation of Guildhall, Brasenose Road (£1,019), for E.C.; borough engineer, Municipal Offices, Bootle.

Bridgnorth.—Houses for T.C.; I. M. Nicholson, Town Hall.

Brighouse.—Extensions to fire station, Halifax Road for T.C.; Pickles Bros. (Builders), Ltd., Mile Thorn, Halifax.

Two electric pumps at refuse destructor works for T.C.; H. A. Sneezum, borough engineer, Town Hall.

Cheshire.—Completion of Harrytown School, Bredbury, for E.C.; county architect, The Castle, Chester.

Cradley Heath.—Laundry block for Staffs C.C.; A. J. Crump & Sons, Ltd., builders, Aston Road, Dudley.

Cumberland.—New factories and adaptation of existing buildings; Cumberland Development Council, 30, Roper Street, Whitehaven.

Curragh Camp.—Optical workshop and compass testing building, for Commissioners of Public Works; G. P. Fagan, secretary, Office of Public Works, Dublin.

Darlington.—Central kitchen (£3,000) for Education Committee; borough surveyor, Town Hall.

Works extensions, Neasham Road; John Tinsley, Ltd., Nestfield Engine Works.

Devon.—Rebuilding Halberton School, Tiverton, for County E.C.; H. V. de Courcy Hague, county architect, Heavitree Road, Exeter.

Dundee.—Conversion of large houses to small flats, for re-housing homeless; town clerk, Municipal Offices, City Chambers.

Durham.—Additions, West Stanley Alderman Wood Secondary School, for C.C.; F. Willey, county architect, 34 Old Elvet.

Ealing.—Church, Horsenden Lane; C. A. Farey, architect, 83, Prince Albert Road, N.W.8.

Glasgow.—Alterations and additions, Croft Bodybuilding and Engineering Co.; J. M. Munro & Sons, architects, 307 West George Street.

Alterations, 392–400 Argyle Street, for The Trades House of Glasgow; F. Burnet & Boston, architects, 180 Hope Street.

Factory additions, for Easiephit Footwear, Ltd., Bardowie Street; Greenlees & Sons, Ltd.

Hartshill.—Reconstruction, ophthalmic department, N.S. Royal Infirmary; governors.

Holland.—Conversion of Boston casual wards to maternity hospital, for C.C.; county architect, County Hall, Boston.

Irthlingborough.—Fire station; J. K. Perkins, Ltd., Progressive Works.

Liverpool.—Extensions, City Technical College, Fontenoy Street, for E.C.; L. H. Keay, city architect, Blackburn Chambers, Dale Street.

Completion of 180 flats; city engineer, Municipal Offices, Dale Street.

London.—Shelter accommodation at rest centres (£250,000), for L.C.C.

LEWISHAM.—Additions, South Eastern Hospital for Children; C. P. Whitley & Son.

Additions, report centre, Downham (£4,500); borough engineer.

Longton (Staffs).—Additions, Adderley Green Workmen's Club, Anchor Road; secretary.

Macclesfield.—Houses (8) Adlington; clerk to R.D.C., 19, King Edward Street, Macclesfield.

Manchester.—Laboratory, Twining Road; Manchester Oil Refinery Co., Ltd., Barton.

Boiler house and workshop, Trafford Park Road; F. Hills & Sons, Ltd.

Experimental feeding centre, Ardwick; city architect.

Shelters, Institutions £9,000, and at schools £24,000; city architect.

Mansfield.—Nurses' Home, West Hill Drive, for governors; B. C. Bestwick, architect, White Hart Chambers, White Hart Street.

Central kitchen for schools (£2,400), for E.C.; W. Thompson, borough surveyor, Municipal Buildings.

Newcastle-on-Tyne.—Buildings for Newcastle Model Milk Co., Ltd., Sutton Street.

Oil store; Rimer Bros., Skinnerburn Road, Newcastle.

Factory extension for Metal Box Co.; J. A. Hodgson & Co., Heaton, Newcastle, contractors.

Northants.—Recreation hall, Rushden Sanatorium (£1,000), for C.C., and school shelters, Wollaston, Irchester, and Earls Barton, for E.C.; G. H. Lewin, county architect, County Hall, Northampton.

Poynton.—Conversion of cinema, Clumber Street and Bulkeley Street, into church and parish hall, for the Rev. J. Kelly; Hill, Sandy & Norris, architects, 9, Albert Square, Manchester.

Preston.—Houses, L. Titherington, builder, Ellen Street; G. G. Baines, architect, 12, Guildhall Street.

Additions, Brook Street Mills; J. Cartmell & Sons, Ltd.

Rugby.—Two new wards (£1,500); Board of Management, Rugby Hospital.

Scarborough.—Additions, Scarborough Hospital; Jones and Rickaby, architects, Westborough.

Sedgley.—Laundry and engineering work at Institution for Staffs C.C.; A. M. Griffiths & Sons, Ltd., Thomas Street, Wolverhampton.

Sprotborough.—Extensions, Richmond Hill Schools, for West Riding E.C.; H. Wormald, county education architect, County Hall, Wakefield.

Stafford.—Houses, Forton, Gnosall, Moreton, Ranton and Colwich, for R.D.C.; Surveyor's Office, Milford.

Stannington (Northumberland).—Plant for the cold storage room at Wood House Homes; W. W. Tasker, county architect, County Council Offices, Mitford Road, Morpeth.

Stourport.—Conversion of Lickhill Manor to maternity annexe (£1,000), for Lucy Baldwin Maternity Hospital.

Walsall.—Hotel, Lower Rushall Street and Holtshill Lane Junction; Highgate (Walsall) Brewery Co., Ltd.

Wolverhampton. — Works additions; Tarslag (1923), Ltd., Dunstall Road.